THE TOOL ENGINEER

FFICIAL PUBLICATION OF THE ASTE AMERICAN SOCIETY OF TOOL ENGINEERS

ehind every product that is mass produced is the tool engineer

NOW..

You can bore large precision work to polar co-ordinates

Here's a brand new feature on the Pratt & Whitney No. 3B Jig Borer . . . a really *big* precision rotary table, 48" in diameter, that is built right into the machine.

For the first time, this makes available equipment to bore large precision work to polar co-ordinates . . . plus regular rectangular co-ordinate work . . . one or the other *or both* without a change in machine set-up.

On circular work, the average job can be done to excellent accuracy using only the precision worm indexing mechanism. For still closer accuracy, a spacing system may be incorporated in the outer table rim. Power traverse is provided on both slides and on the rotary table.

For accurate boring on the thousands of fixtures and tools needed for producing the goods of peace, find out what this new jig borer feature will do. Full information is available on request.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

PUBLISHED MONTHLY BY

THE TOOL ENGINEER

AMERICAN SOCIETY OF TOOL ENGINEERS

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National Headquarters

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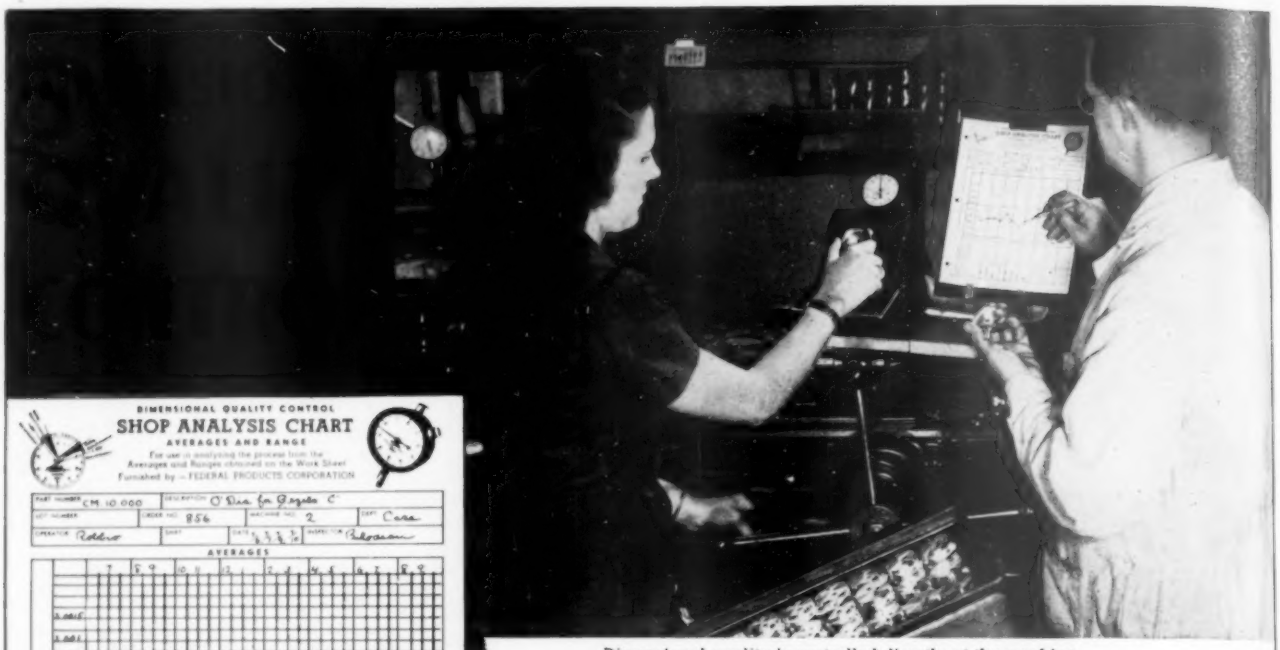
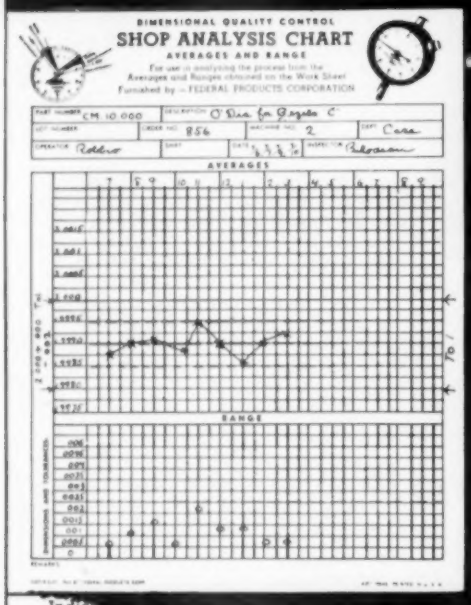


Dimensional quality is controlled directly at the machine.



Indica... the data and means to keep dimensions under control.

Economical Control at Production — a Management Tool

Federal Indicating Gages plus Quality Control Charts Make Graphic what is happening at the Machine

The case history of the application illustrated above of Quality Control by statistical methods, based on the accurate readings of the Federal Indicating Gage, shows the practical result of controlling a critical dimension of our own product.

A piece intrinsically difficult to turn, a dimension hard to maintain, and an out-of-round condition prohibited by assembly conditions. Rejects, rework and scrap ran high, unit hours low. Imperfections at this operation directly fostered inaccurate performance of the finished instrument.

After the introduction of Quality Control scrap figures dwindled by 75%. Even greater satisfaction was gained from the even flow of homogeneously dimensioned pieces coming from this operation.

With Quality Control and Federal Indicating Gages inaccuracies are discovered *before* they develop, operator interest increases, wasted time and material disappear and a product is made that renders better service to the ultimate user.

Write for the Federal Quality Control Primer, a simplified, practical way to apply Quality Control.

3 GAGING SYSTEMS

MECHANICAL

Adaptable and economical Dial Indicating Gages for the usual control requirements.

AIR

A new air System for extremely fine finishes and measurements. Many new exclusive features.

ELECTRONIC

An extremely fast, sensitive instrument with a multitude of possibilities.

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*Quality Control by Statistical Methods.

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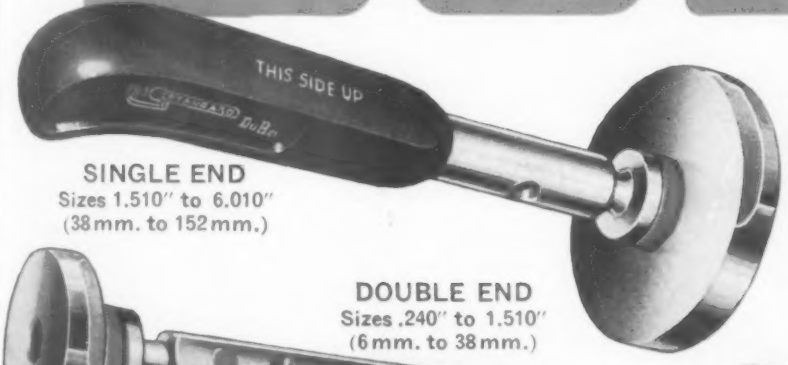
Now! CHECK BORES FASTER more accurately

NO PILOT NECESSARY

DuBo



SINGLE END
Sizes 1.510" to 6.010"
(38mm. to 152mm.)

DOUBLE END
Sizes .240" to 1.510"
(6mm. to 38mm.)

PATENTS PENDING

...that New, Better PLUG GAGE by STANDARD

HERE is a radical improvement over old-style, limit plug gages. DuBo is designed for greater ease - in - use, finer precision, more thorough inspection, faster gaging. Its unmatched lightness and balance give finger-tip control and amazing sensitivity in revealing internal bore conditions ordinarily passed over by common cylindrical plug gages.

Write for Special Bulletin.

DuBo Tells More...More Easily

Spherical gaging surface, chamfered, relieved and self piloting, enables DuBo to be inserted easily into bores of extremely close tolerance.

Out-of-roundness, taper, belling and dimensional deviations revealed by unmistakable tilt of handle.

May be used in deep bores and close to the bottom of blind bores.

Finger-tip "feel" and control reveal internal conditions at any point in the bore. Light weight minimizes fatigue.

Plastic color signals, Green for Go, Red for Not Go, make identification easy, prevent errors in reading.

Chamfered edges automatically wipe bore and help prepare a clean surface for accurate gaging.

STANDARD GAGE CO., INC., Poughkeepsie, N.Y.

PRECISE ENGINEERING FOR PRECISION PRODUCTION

STARRETT TOOLS

A Starrett "Mike" on the job at Consolidated Vultee Aircraft Corporation's Fort Worth Plant

Checking the angle on a connection form die with a Starrett Bevel Protractor at Curtiss-Wright, Buffalo.

A Starrett Vernier Height Gage at Fairchild Aircraft Division of Fairchild Engine and Airplane Corp., Hagerstown, Md.

At an American Airlines shop a propeller is being checked by a Starrett Micrometer.

where a *"Hair Off"* may mean a close shave . . . you'll find STARRETT TOOLS

Starrett Calipers in action at Douglas Aircraft Co.'s Santa Monica plant.

Your work, too, has no doubt had to meet higher standards of precision and uniformity at the same time you've had to turn it out faster than ever.

Starrett Micrometers, Vernier Gages, Dial Indicators and other fine measuring tools lend skilled hands the added confidence and sureness that has meant both accuracy and speed. In the strenuous competitive days to come you will find it equally worth your while to ask your mill supply man for Starrett Tools.

Starrett Micrometers speed accuracy at Lockheed Aircraft Corp., Burbank, Cal.

Now, with 4 Service Stars

THE L. S. STARRETT CO. • ATHOL • MASSACHUSETTS • U. S. A.

World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
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P & J EQUIPMENT CAN BE RE-TOOLED . . . FOR FURTHER LOW-COST PRODUCTION

The need for cost-cutting in the era which lies ahead can be met with existing P & J equipment, because P & J design is such as to facilitate re-tooling. Thus a P & J machine, such as the 6 DRELX shown here tooled for machining brake drums, can be readily changed over for producing any other parts which come within the scope of its capacity. The new work will be handled at minimum cost.

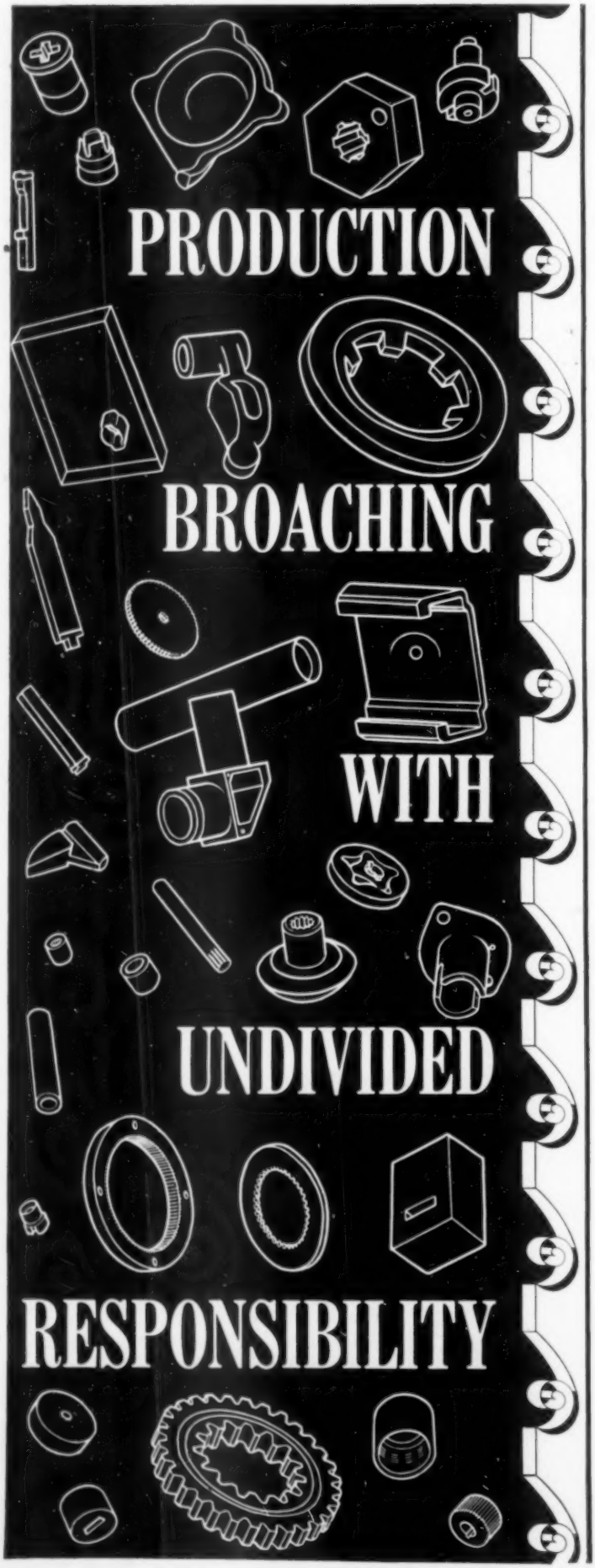
Practically every P & J machine now in service offers an opportunity to be of further, low-cost productive use. Now is the time to consider the part your P & J equipment can play *profitably* in your reconversion program. P & J engineers are at your command to help you re-tool to greatest advantage.

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

"U. S." Stands for "UNCONDITIONAL SURRENDER" Buy More BONDS

P & J REBUILDING SERVICE Owners of P & J Automatics are invited to investigate P & J's plant facilities for rebuilding their machines to original accuracy and productivity. Re-tooling can be conveniently handled at the time of rebuilding.

POTTER & JOHNSTON MACHINE CO.
PAWTUCKET, R. I.



THE largest plant of its kind in the world is ready now. Michigan has a new and completely equipped plant for *diversified commercial Broaching.* When BROACHING is indicated in your postwar "Processing" don't substitute costly machining methods.

If you don't have equipment.
If your equipment is filled up.
If in a hurry to get started.
If you have complicated jobs.
If runs are too short to tool up.

Let MICHIGAN engineer the job — design and build the tools — broach the part — and do it all with UNDIVIDED RESPONSIBILITY.

WE DESIGN — BUILD — RECONDITION AND USE BROACHES

We design and build every type and size of broaches—broaching fixtures—involute gages (plug and ring) arbors —holders and pullers for broaching.

Michigan specializes in broach reconditioning and resharpening

M B C
BROACHING SIMPLIFIED

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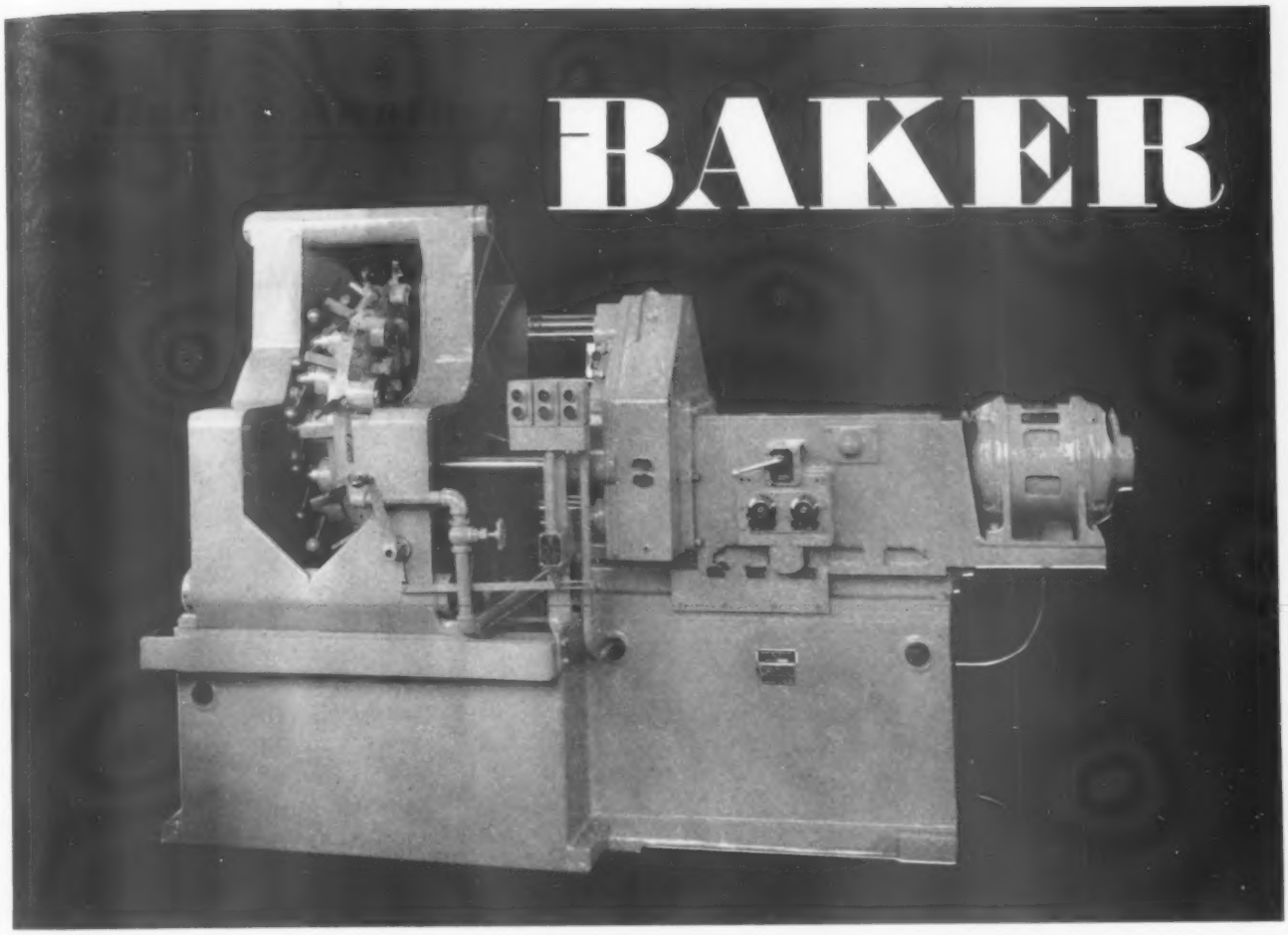
For complete information on Production Broaching, send your parts prints and production requirements to Department M, Michigan Broach Company.



Self-contained Hydraulic Feed Drilling Unit

—Adapted to single spindle and multiple spindle drilling, boring, reaming, counterboring, hollow milling, chamfering and facing operations with units mounted either in horizontal or vertical planes.

Here is a new design: a compact, self-contained hydraulic feed drilling unit with one-way multiple-spindle action. It is very flexible and easily adjusted for feed lengths and feeding rates. Hydraulic feed employs a thoroughly tried, new design variable delivery pump requiring minimum horsepower. This frees most of the power for torque load!

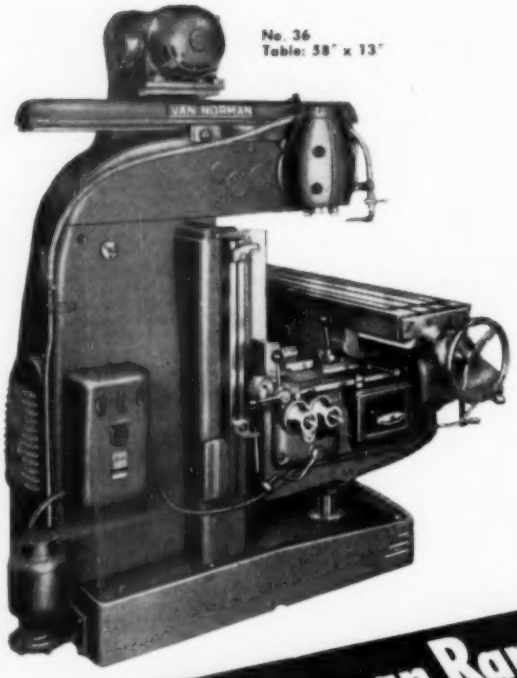
Standard model's control panel provides two-feed cycle; however we can supply this model with positive stop and delayed reverse feeding cycle. A jump speed attachment is also available.

Standard model has direct coupled motor drive mounted on sub-base to rear of unit housing. We can also supply this machine with motor mounted on top of main housing with vee-belt drive. We make these special arrangements available as part of our policy to design machines adaptable in the maximum degree to meet your special needs.

This outstanding Baker machine has a hand indexing trunnion fixture permitting loading and unloading while operations are in progress. This will increase your production since machine need not be idle while operator is chucking work. A power automatic index trunnion fixture is also available—and we can arrange this unit with either two-way, three or four-way machines.

Standard unit with direct coupled motor drive is designed for high production work and is not arranged with pick-off gears for changing main driver spindle speed. Gearing inside unit housing nevertheless allows for a wide range of spindle speeds. For lower production requirements requiring speed changes at certain intervals, we can specially furnish the unit with provision for speed change pick-off gears by mounting motor on top with Vee-belt drive.

For further techaical advice on this and other Baker self-contained hydraulic feed drilling units—or for an outside slant on your pet production problem—write or wire us collect today.



No. 36
Table: 58" x 13"

No. 22L
Table: 45" x 10"

Only Van Norman Ram Type Milling Machines give you

★ HORIZONTAL
★ VERTICAL
★ ANGULAR MILLING

The big advantage of Van Norman Ram-Type Millers is their versatility. With these machines you can perform any kind of milling from horizontal to vertical simply by positioning the adjustable cutterhead. The result is increased machine production through elimination of idle operator and machine time. In addition, the adjustable cutterhead permits the operator to carry most jobs through to completion without changing the work setup . . . insuring accuracy and reducing rejects.

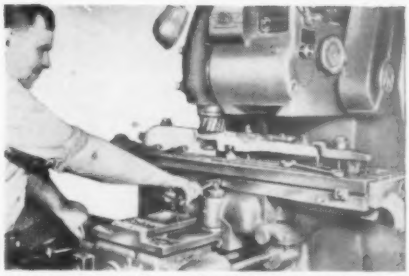
Here's a typical example of how Van Norman Ram-Type Millers fit into your general purpose and tool room picture. You have three ram-type millers.—Today the work schedule calls for two horizontal millers, one vertical. The operators simply position the cutterheads of two machines to horizontal and one to vertical and go ahead with the work. No waiting for specific machines . . . no loss in profits. Horizontal, vertical or angular, period to period, each Van Norman Ram-Type Miller can do the work.

Added to versatility, Van Norman gives you front and rear controls, exclusive single lever feed selector, movable ram, dovetail ram ways plus other advantages which speed milling operations, save money and assure accurate work.

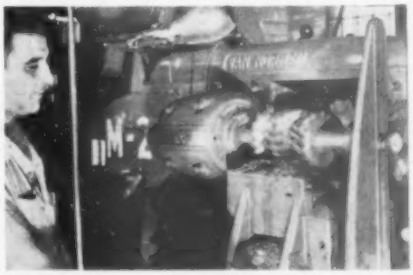
Investigate Van Norman Ram-Type Millers. They are available with plain or swiveling tables for every type of work. *Each machine will not only meet today's requirements but will be ready for tomorrow's jobs as well.*

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

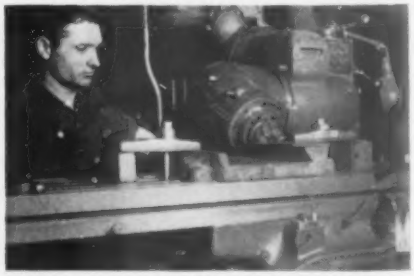
"It pays to Van Normanize"



The Ram-Type Miller used with the adjustable cutterhead in the vertical milling position and the operator using the front directional controls.



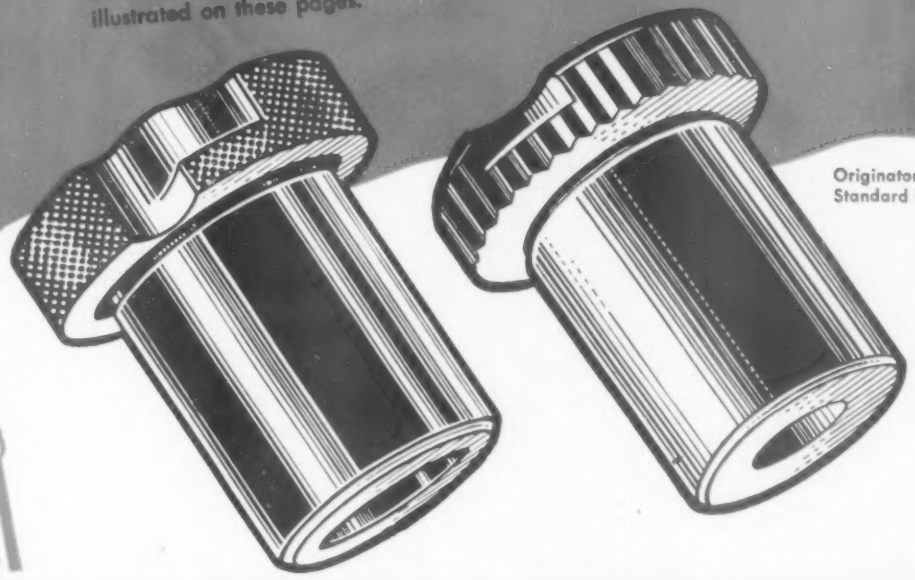
The Van Norman Ram-Type Miller with the head locked in the horizontal position for a gang milling operation.



With the cutterhead locked in an angular position, the operator is taking an angular cut on the workpiece, operating the miller with the rear directional controls.

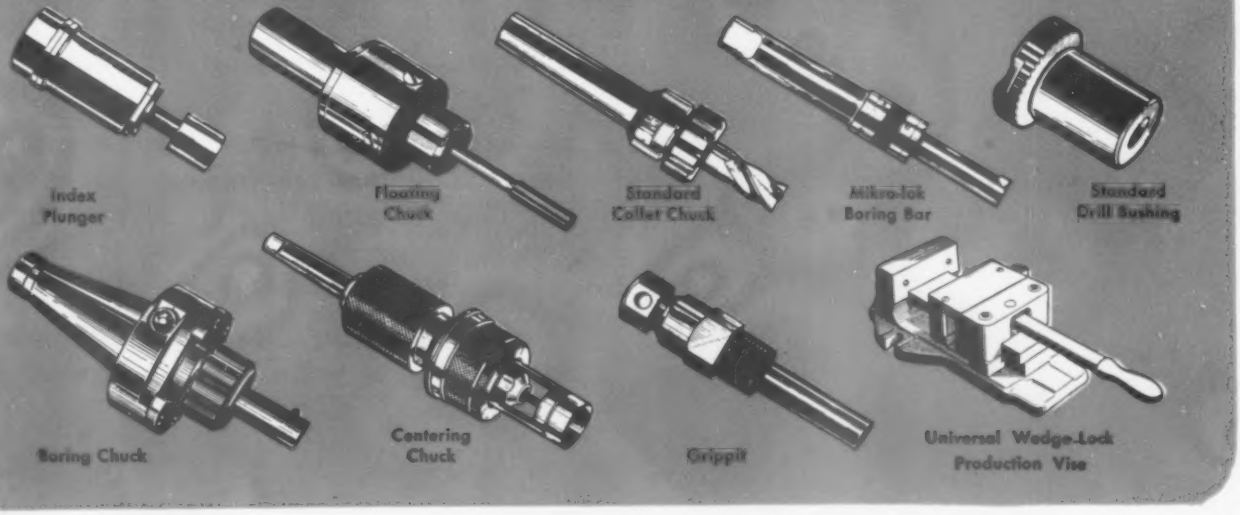
Their superhoned bores increase life of tools and drills

You are assured of more accurate, less costly drilling and reaming when you use Universal Drill Bushings. Their bores are precisely honed within extremely close limits of accuracy. Thus, they offer unexcelled resistance to wear and the galling action of chips. Straight and round to within .0003", they accurately guide tools. Knurled or serrated heads afford firm grasp for easy insertion or removal from jigs. Write for complete information on Universal Drill Bushings or any of the other superior Universal tools illustrated on these pages.



Originator of Standard Drill Bushings.

UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND ACCURACY IN YOUR PLANT



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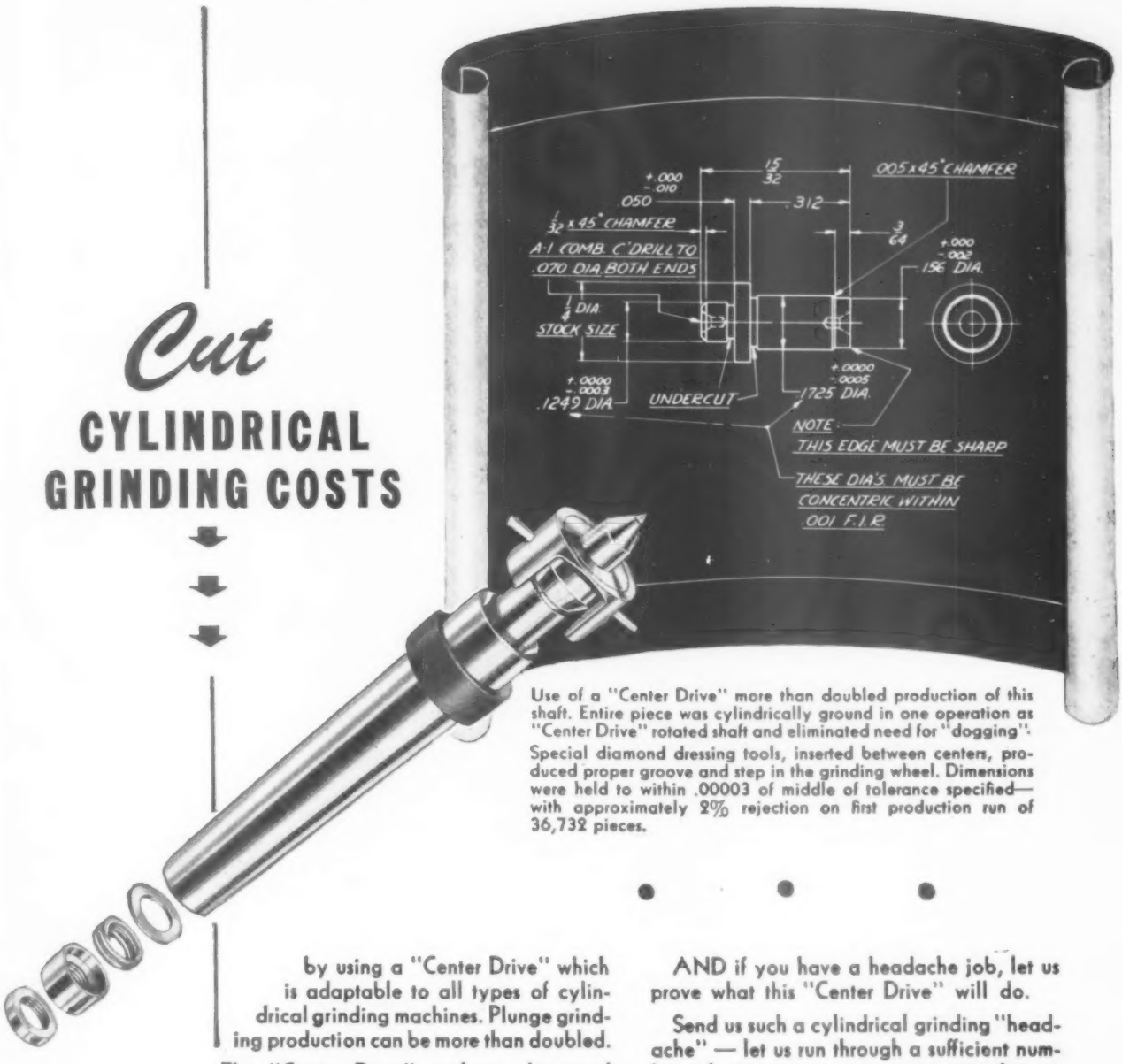

Use of a "Center Drive" more than doubled production of this shaft. Entire piece was cylindrically ground in one operation as "Center Drive" rotated shaft and eliminated need for "dogging". Special diamond dressing tools, inserted between centers, produced proper groove and step in the grinding wheel. Dimensions were held to within .00003 of middle of tolerance specified—with approximately 2% rejection on first production run of 36,732 pieces.

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by using a "Center Drive" which is adaptable to all types of cylindrical grinding machines. Plunge grinding production can be more than doubled.

The "Center Drive" replaces the usual headstock dead center. *Use of "dogs" to hold and drive work is eliminated.* "Center Drive" becomes an integral part of piece being ground — rotating it between dead centers, thus insuring absolute concentricity—permits grinding both ends of work, or grinding one or more different diameters, contours, angles and radii in a single plunge operation. Tolerances can be held to .00005 with practically no rejections.

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AND if you have a headache job, let us prove what this "Center Drive" will do.

Send us such a cylindrical grinding "headache" — let us run through a sufficient number of pieces at your present production costs to permit our Engineering Service to develop a technique and necessary tools—built around the "Center Drive" — to so speed up output as to offset development expenses. We will then turn over to you all tools and operating instructions for doing the job yourselves — AT NO ADDITIONAL COST TO YOU.

Write, wire or phone us — let the "Center Drive" increase your cylindrical grinding PROFITS.

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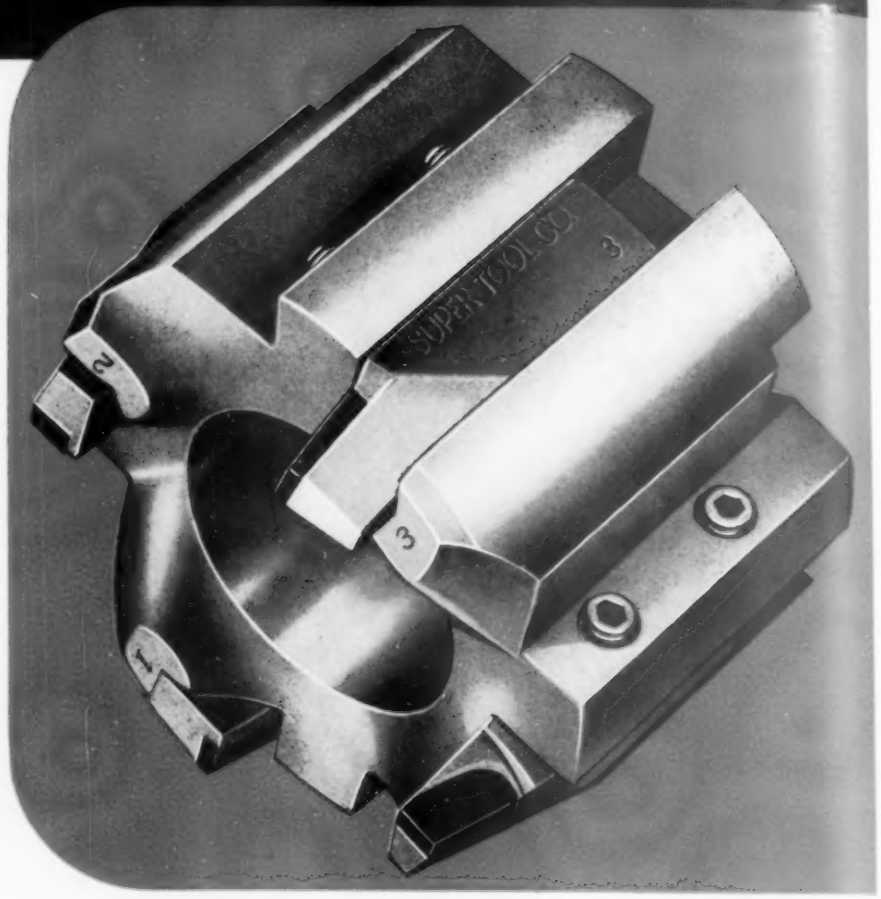

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Simple to set up . . . sturdy body . . . adequate chip clearance . . . this tool is built to "step up" the tough production job.

LOOK FIRST TO SUPER Whatever Your Cutting Job

In addition to all types of special carbide-tipped tools, Super Tool Company manufactures a complete line of standard carbide-tipped bits, reamers, plain and side mills, shell end mills, face mills, end mills, counterbores, drills and centers. Specify Super Tools . . . Get Super Satisfaction.

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The Tool Engineer's Next Job

ON APRIL 8, 1946, the A.S.T.E. once more will help to make History. On that day, the most important industrial Exposition since the advent of Mass Production will open in the Cleveland Auditorium and its various Annexes.

The A.S.T.E. has held "shows" before, but never one like this. Not only will it cover a floor area of a quarter million square feet, but in that area will be condensed the most important developments in production processes, equipment, tools, and the like, the country has ever seen.

It may well be asked why the A.S.T.E. did not schedule this exposition for an earlier date. The answer is quite simple. Until VJ-Day, Industry was so vitally immersed in war production that but little thought could be given to completion of new developments for "Post-war."

Not until a final military victory was won, could Industry really make plans for tomorrow's "Peace." This meant that the Tool Engineer had two jobs to do. His first was to achieve a quick temporary "re-conversion" from war-time to peacetime products. That job had to be done fast. There was no time and there still is no time to take advantage of all that has been learned and evolved in recent years, if critical unemployment and a serious depression are to be avoided.

That job alone is so stupendous that it will be virtually impossible for the Tool Engineer to get down to his second and *real* job before next spring. That job is:

"To make it possible for Industry to produce more goods and better goods, at lower prices, while Industry is paying higher wages to the men who produce those goods."

The 1946 A.S.T.E. Exposition is intended to make the Tool Engineer's second job a little bit easier. We hope and expect to bring together at that Exposition the most important of all new developments which may help him in that task.

He is going to need all the help he can get. If he does his job well, our Nation will continue to stride ahead economically. Our standard of living will continue to rise. If he fails, our Nation, industrially, will inevitably sink to a lower level.

Today, the Tool Engineer is the key to our future well-being, just as he was the key to whether we could build "enough and in time" during the war. Without him, our wartime production miracle would have been impossible. Without him, we cannot win the peace at home.

C. V. BRINER,
President, 1945–46

By Jay Bowen

The Qualifications of a Die Designer

Practical experience, supplemented by technical training, plus a knowledge of tools, equipment and methods, are essentials in modern die design.

IN OUTLINING the qualifications of a die designer, the writer would say that, in his opinion, the most essential factor is that he shall have had practical experience in both press room and die shop. He must also be an able draftsman, so that he may convey his ideas to the mechanic or diemaker.

A great many die operations can be laid out, and designs of tools carried through, by any good tool or machine designer. In this case, there comes to mind simple forming operations such as bending and flanging, cutting operations such as blanking and piercing, and certain draw operations where the shape is round or symmetrical and the depth of draw uniform.

Jay Bowen was born in McComb, Miss., where he served apprenticeship with the Illinois Central R. R. and where, together with correspondence courses in engineering, he also studied design. After a thorough grounding as die maker, die leader, die room superintendent, estimator and designing engineer with leading die concerns, joined the McReynolds Die & Tool Company, Detroit, in 1935. An authority on dies, Mr. Bowen is a member of Detroit Chapter, A.S.T.E.

Most dies for the types of operations mentioned will be found graphically described in any number of good text books, and any competent engineer or mechanic should be able to follow these descriptions and instructions so as to produce simple or regular shaped stampings as required. However, we cannot call such procedure die designing, nor is anyone who works in this way entitled to be rated a die designer.

There are many good die designers who are not qualified to design all classes of dies. For that matter, comparatively few are, due to the fact that there are several distinct fields of stamping work. In the automotive field, alone, there are men who qualify on large stampings made of comparatively light gage material, such as used for body panels, fenders, and so on, and others who specialize in chassis parts—as frame parts and axle housings—of heavier gage materials. Again, there are the die designers in the electrical, telephone and radio fields, some of whom are experienced in stamping production entirely foreign to anything that the die designer in the automotive or heavier stamping field has to contend with. Progressive dies, in any field, are almost a specialty as they require numerous steps and breakdowns and are operated in high speed, roll feed presses.

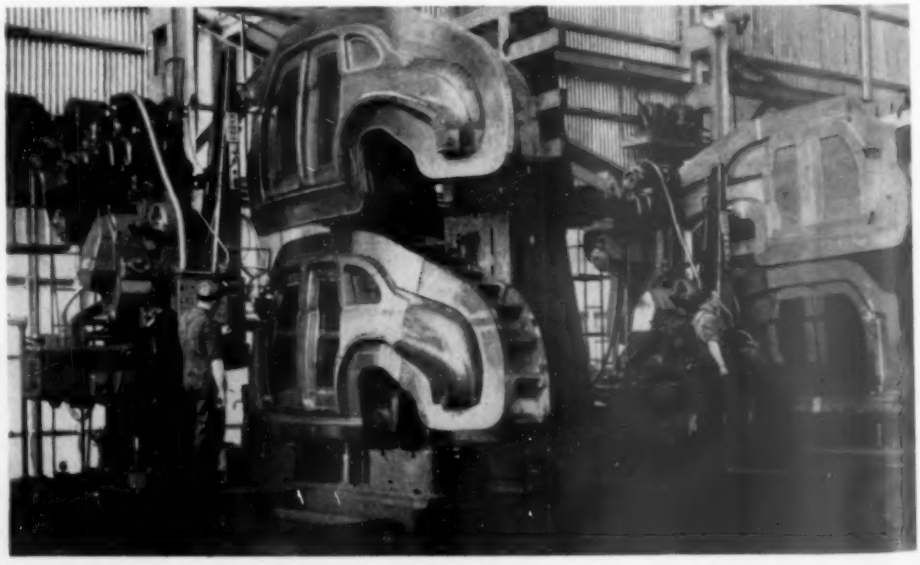
In the production of stampings, and especially those exposed to view in the assembly of any product such as automobiles, refrigerators, stoves, and so on, appearance is an important factor and this is governed by "diemarks" which are created by the material stretching between various points on punch and die. As, for example, by the draw edges of the blankholder at the point where the material ceases to stretch and starts to run in and by edges of forming sections where there is a great deal of resistance to forming and from material recoiling from the face of the punch in flanging or forming.

These marks create a finishing problem which, in most cases, consists of polishing and buffing, or, occasionally, power hammering—quite a costly process! Naturally, these marks must be eliminated, in die operations, to the greatest extent possible, and one of the acid tests of a good die designer is that he foresees and prevents such marking. In most cases it cannot be fully avoided, but, it can be reduced to a minimum. Needless to say, this ability is only acquired in a practical way by close contact with actual press room operation.

Essentially A Process Engineer

The good die designer is, first of all, a process engineer or operations man on stampings. Almost any good machine designer or tool draftsman can lay out a die and produce a working drawing from which it can be made, if the work is done under the supervision of a good die designer. This, however does not necessarily make him a die designer.

In early diemaking, in the automotive industry, die drawings were unknown. Each die leader took enough of brown wrapping paper, from a roll, on which to sketch up the die to be made. He then went to the steel rack and procured material, and to a huge pile of castings of die shoes indiscriminately scattered on the floor, for the die set. Often as not, the size he would be looking for would be at the bottom.



Automatic duplicating an automobile body die on a Keller machine. A tracer finger, moving across a wood or plaster model, controls the path of the cutter. Automatic, tracer controlled duplicating has revolutionized die making. Photo by courtesy of Pratt & Whitney Division, Niles-Bemont-Pond Company, West Hartford, Conn.

He did most of his own machine work and also tried the die out and got the stamping ok'd by a rather sketchy inspection department. However, this method applied, even in those days, only to small and medium classes of dies. Large dies, for body panels, were practically designed by the pattern supervisor in collaboration with the toolroom supervision.

Since then, great strides have been made in the stamping field. Steel over wooden frame bodies has been supplanted by the all steel body, and built-up panels and parts have been eliminated by drawing in one piece. For example, doors for closed bodies, in earlier model cars, were of built-up construction, the outer panel alone being made in sections consisting of a lower panel, front and rear pillars and a header panel, all of which naturally required a great amount of small dies and presses.

Materials and Equipment Improved

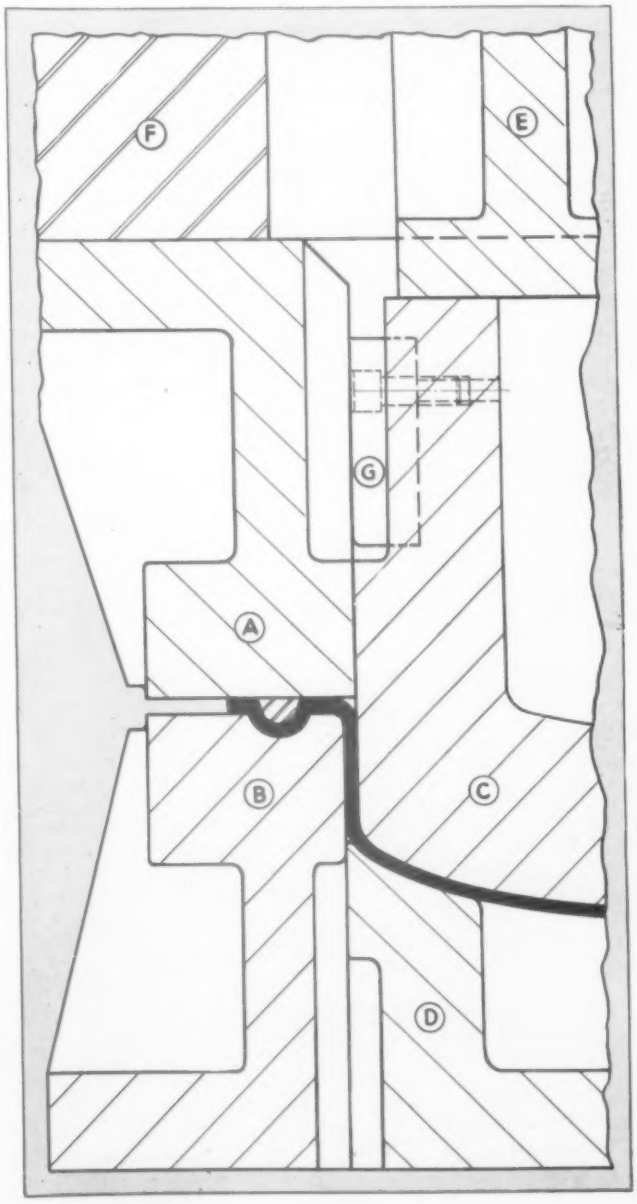
Materials have also been greatly improved, as to ductility and tensile strength, in the past twenty years, while presses and press attachments, and control equipment, have been vastly improved in design and construction. Diemaking equipment has kept apace with development in stamping machines, the greatest advance being, perhaps, the Keller duplicating machine and various duplicating attachments for boring mills. These machines and attachments enable large panel stamping dies to be made to a degree of accuracy that would be unattainable without them except at a great expenditure of labor, time and money.

It is difficult to duly credit this advance in the stamping field—that is, whether to credit the product engineer who brings forth tougher and more intricately designed parts, and demands that they be made without modification, or die designers and diemakers who refuse to be daunted by anything put before them. Along with these, we must not fail to give due credit to the metallurgists who, from year to year, give us improved materials from which to make these parts. Without their cooperation, the modern stamping field would have much greater limitations.

In the processing and designing of a set of dies to make a stamping, the designer must first of all consider the press equipment at his disposal. It is not always possible to have adequate equipment and, in some cases, he will find that the equipment available is not suited to the operations required to make a particular stamping. In such a case, new or other equipment must be obtained or the part must be passed on to another plant to be manufactured. He has, however, another alternative. It may be that the part can be redesigned, modified or made in several pieces, so that the present equipment can be used with the part and still meet the necessary requirements—at least, without detracting from it.

In cases where stampings are used to a large extent, there should be close cooperation betwen the product designers and the die designers so that one is not forever running into the "impossible". There are still limitations as to what a die will do and the extent to which material will stretch or flow. For example, we are occasionally confronted by stamping designs which have numerous embossings and beads which are in close proximity to each other and which must be made from dead stretch.

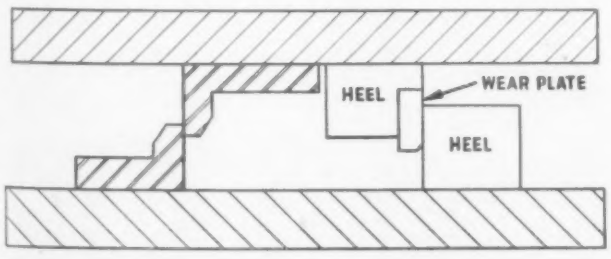
Obviously, there is a limit to what can be obtained in depth in such sections; however, product engineers still come through with these "impossibilities". Then, it is up to the die designer to recommend modifications, and, a good liaison man, who knows what dies and sheet metal will do under various conditions will be of unlimited help in advising the product designers regarding the manufacturing possibilities of a part.



At right. Section thru the blank holder of a typical draw die, such as used in the automotive stamping field. A and B are blank holder rings. C is the punch. D is lift out pad which, when so required, pushes metal into the face of the punch. E is a punch extension—or riser—and while a part of the die, is a separate piece to facilitate its making. F is a blank holder plate—or adaptor—and, in most cases is press equipment. G is a wear or side thrust plate, and is more conveniently applied to the punch. There should be at least two on each long side and one on each end and they should line up with a finished wear strip in the blankholder ring. Some die users prefer to mount these in ring with a wear strip on the punch, which enables them to install adjusting screws. However, this is not so rigid a construction.

There should never be any doubt as to the facer of A & B being wide enough, at any point, for the amount of metal that must be pulled into the die. They should also be heavy enough, or thick enough, for a change in a draw line if necessary.

Below. Always balance action of cutting or forming sections on one side of die only, with heel blocks and wear plates. Never depend on guide pieces alone to maintain alignment on dies of this type.



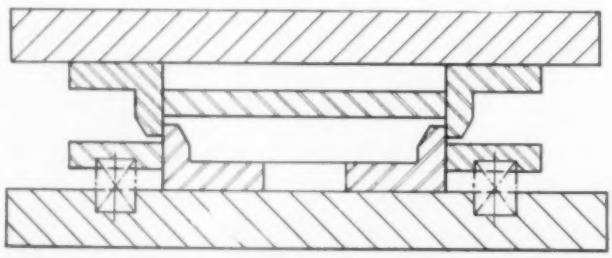
The good die designer should be adept at establishing and developing ring lines and draw faces, on blank holders, on all classes of draw dies for the production of irregular shaped stampings. This part of the die designer's function cannot be done on the drafting board, but must be worked out, in cooperation with a patternmaker or craftsman in wood and plaster, through the actual building or modeling of these surfaces in plaster and wood around a model of the part.

By so doing, it is possible to determine, to the greatest extent, the contacting of the punch with the sheet, where stretcher marks are liable to occur and the best methods of avoiding as many of these marks as possible. One must determine where stretch is required, where it will do the most good to raise or lower the ring line to bring it closer to the punch or farther away, as the case may be, to do the most good.

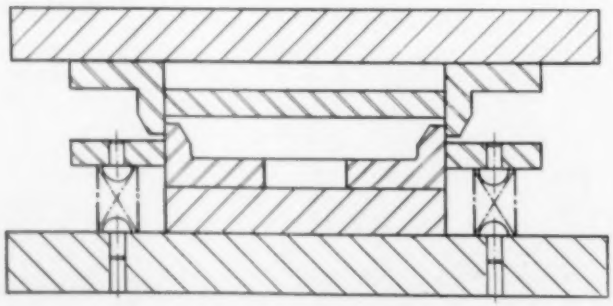
There are cases where excess surfaces must be added to the punch, in the form of bulges or extra embossings—or, to use the vernacular, "sausages". These are for the purpose of pulling any excess metal from the part and, of course, must be added outside of the confines of the part itself. They are trimmed away afterward. There may be, at times, openings large enough in the part so that these takeups may be added and pierced out of scrap.

Die Terms and Nomenclatures

At this point, we will digress from the subject of design long enough to discuss misused die terms and nomenclature. The most abused, in the writer's estimation, is the word "blank". Die designers often designate piercing operations as blanking. Obviously, you can only blank a blank. An opening or hole of any sort can only be produced by punching, piercing or perforating, and die operation termed by some designers as "blanking window opening", "blanking lightening holes", and so on, show that these designers have passed but very little beyond the novice stage. While the "perforate" is perfectly good English when applied to the piercing of a single hole or opening, it should—in the writer's opinion, at least—be relegated to that class of dies that produce large numbers of holes closely spaced in the sheet or formed part.



Above. Blank Die—Compound type. Conventional construction of large blank die. Nothing particularly wrong with design—i.e., it will work—but it is difficult to make. With a sub-plate, as shown below, locating and fitting of sections will be greatly facilitated. If, in addition, a spacing block is inserted (as shown by unhatched section) the cutting edges will have a solid backing.



A good die designer is thoroughly familiar with the materials with which he has to work, not only with the sheet metal from which he has to produce parts, but also those used in the fabrication of dies. There are two general classes of dies with which we have to contend:—those which are to produce stampings in large quantities and over a long period of time, and the short run variety.

Rugged Construction Essential

At no time should a die be of such flimsy construction, regardless of production requirements, that it will not stand the gaff. The cost of material saved is sure to be expended—and more too—in maintenance. Cast iron or semi steel (and semi steel is only cast iron with a higher sounding name), machinery steel and cold rolled steel are the cheapest of materials in the long run, and should never be skimped on as extra "beef". Where and when it is needed, it is the best assurance of good stampings, less a lot of die marks and finishing costs, and dies that are constantly being reworked in the press during production and between runs.

There have been many alloy tool steels and alloy castings developed especially for die construction, and these provide long periods of production between reworkings and die repairs. There is a wide range in all of these materials, and the die designer should use discretion in selecting materials to incorporate a die design. It should be stressed, at this point, that dimensions—other than those affecting the product made in the die—should be in keeping with the removal of a minimum amount of stock from the piece or section to be fitted into place.

Standard Bar Sizes Recommended

It should not seem necessary to remind the "average" designer of this, but we see so many designs coming through that show pockets and recesses in the castings with, for example, dimensions of 3″, 4½″, 8″ and so on, which necessitates procuring material at least ¼″ larger and, in many instances, ½″ larger. Whereas, if a dimension of 2⅞″, 4⅜″ or 7⅞″, had been used, the standard bar sizes on the inch or half inch could have been used, with considerable waste of labor and material avoided.

There are, of course, rare instances where this cannot be avoided, but in the vast majority of cases standard bar sizes can be specified and this should be zealously adhered to in design and drafting room supervision and checkers should be alert at all times on this point. The designer should refer to a stock list of any large steel vendor whenever he is in doubt as to whether the particular size which he wishes to specify is made, or if made, is available. These seemingly small discrepancies often cause doubt and delay in the toolroom. To one engaged in design, construction and cost of stamping dies, any move to eliminate these errors would be a boon.

The designer should follow the dies through construction and tryout period until an acceptable part has been produced. In so doing, he will be able to avoid, in the future, many costly errors in design, construction and processing. Of all people engaged in the design of tools and machinery for mass production, the die designer should develop the quality and faculty of cooperating and working with the toolmaking and production departments.

Adaptability A Requisite

He is unfortunate indeed if he cannot adjust himself to seeing his 'brain children' revamped at times, even before going to tryout, almost to the point where he can barely recognize them. His situation is comparable to that of the novelist who sees his story come from the hands of a dramatist or scenario writer with only the name of the hero unchanged. After a few experiences of this sort he will begin to foresee quirks and peculiarities of sheet metal forming and drawing and will learn to produce the types of design

that will stand the criticism of any die man from top management down to the fellows who have to make them work.

The technically trained man can only come into his own in the stamping field after he has lived with dies, presses and stampings, and with the men who make them and make them work after making them and seeing them produce day after day the while they are maintained in a producing condition. The director or head of any stamping business or department should make it a personal responsibility to see that the novice, with technical training only, should acquire that practical contact so that he may develop into the type of designer who will be able to produce workable designs that will prove the utmost economical in the long run.

Last, but not least, he should be able to select practical men from the ranks who show qualifications and a desire to obtain technical knowledge, and to guide them toward this goal. In so doing, he will find that he has developed an organization that will cooperate and function to a high degree of efficiency and which will meet most situations as they arise.

By Karl Stad

Die Sets and Accessories

Standard, commercial units effect marked economies in die manufacture.

STARTING with sub-press dies in the eastern jewelry and optical centers, several decades ago, in which punches and dies were assembled in sets and so maintained, the manufacture of die sets and accessories has grown into a considerable industry. In recent years, this manufacture has come to include standard sets and accessories for blanking, piercing, forming, and for die casting dies and plastic mold cavities. Several of the latter sets, made by Detroit Mold Engineering Co., 6686 East McNichols Road, Detroit, were shown in the *Symposium on Plastics*, July, THE TOOL ENGINEER.

These die sets and accessories have effected untold economies in the manufacture of dies. Mass produced, they are inexpensive as regards first cost, and because they are interchangeable on the whole, they cut to a minimum down-time when dies or units are to be replaced on the job. They also reduce the equipment that would otherwise be needed, by jobbing shops and plant tool rooms, to manufacture these parts individually or in small lots.

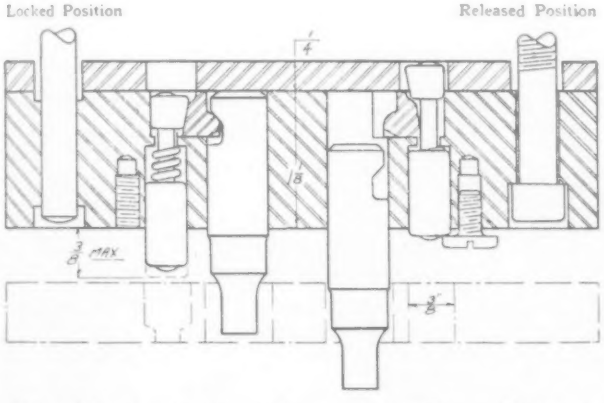


FIG. 1 (above). Interchangeable, standard punches and button dies manufactured by Parsons Punch Company.

FIG. 2 (below). Large Danly Die Set, used for large forming dies such as are used in the automotive and aircraft industries.

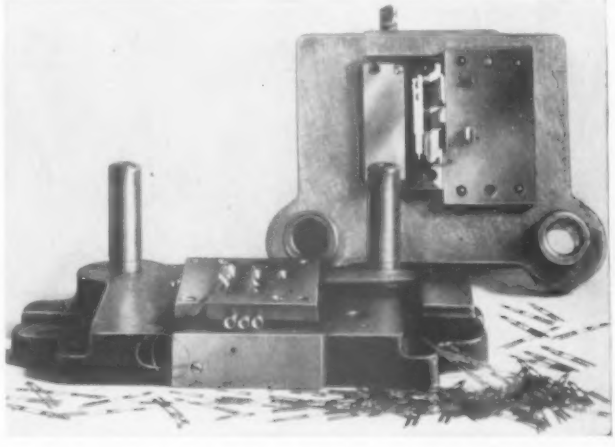
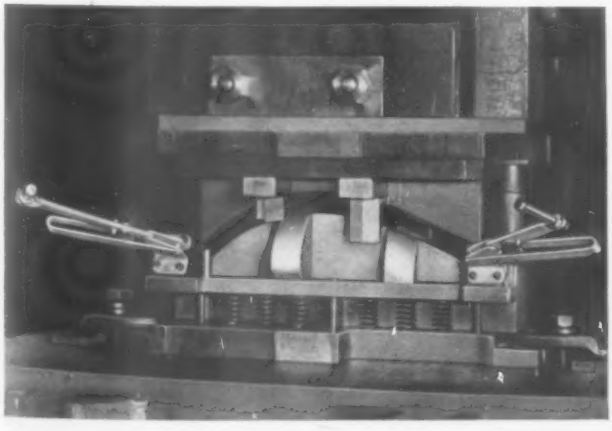
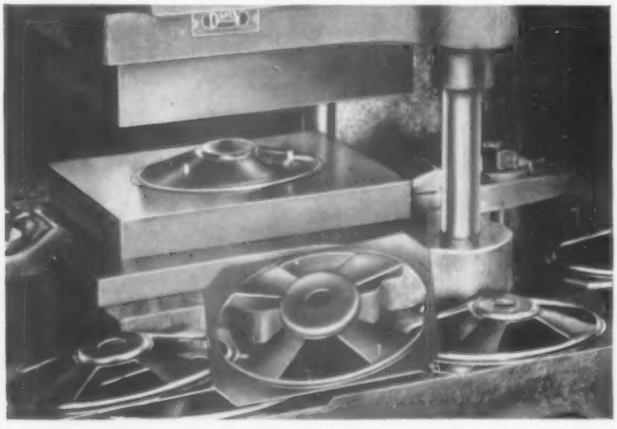


FIG. 3 (above). Danly Die Set with die for stamping contact springs, from silicon bronze, such as are used in organs.

FIG. 4 (below). Danly standard reverse die set and die for producing loud speaker parts.





It is not the purpose here to cover the entire category of these accessories, which, in addition to die sets, includes die springs, guide pins, strippers, interchangeable punches and dies, safety devices and so on ad infinitum. All that would require volumes; anyway, this information may be had from the manufacturers' bulletins and catalogs, or from local sales representatives. Rather, the intent is to show a few typical units, with applications and source of manufacture or supply,* so that those interested—and, at the moment, unacquainted with —these accessories may mentally file the information for future reference.

Fig. 1 shows an assembly of standard, interchangeable punches, with method of locking and release, as manufactured by the Parsons Punch Company, Pontiac, Michigan. This company also makes button head type punches, for use with counterbored punch holders, also, straight body, set screw retained punches and standard button dies. These punches and dies may be set at close centers—as about 7/16 in the small sizes to about 1 5/16 in the larger.

In Fig. 2, we have an application of a typical Danly die sets, manufactured by Danly Machine Specialties, Inc., 2100 S. 52nd Ave., Chicago 50. In addition to a very complete line of standardized die sets, from small sub-press units to sets for larger automotive dies, the Danly line includes guide pins, die springs, dowel pins and miscellaneous accessories.

Fig. 2 shows a large Danly die set in combination with a forming die such as used in the automotive and aircraft industries. Note the toggle clamps, for holding the part during forming. These toggle clamps are also standard, and made in various sizes, and may be had from Detroit Stamping Company, 350 Midland, Detroit, or from Knu-Vise, Inc., 2200 8th St., Detroit.

Figs. 3 and 4 are also Danly die sets. Fig. 3 shows a die used for stamping contact springs from .008" thick silicon bronze, such as are used in organs. Here, the die perforates and blanks. About 23 million springs have been stamped from the die shown, with about 500,000 parts between grinds. Really excellent production! Fig. 4 shows a Danly standard reverse die set, here used for the production of loud speaker parts.

In Fig. 5, we have a line of standardized universal master washer dies, manufactured by Hovis Screw Lock Company, 8100 E. Nine Mile Road, Van Dyke, Michigan. While these are sets, with all units—as punches and dies—interchangeable for hole size and O.D., this company also manufactures standard, interchangeable punches and dies which may be incorporated into large blanking and piercing dies.

* To enable readers to write for literature on the items mentioned, addresses of manufacturers listed are included in the text.—*Ed.*

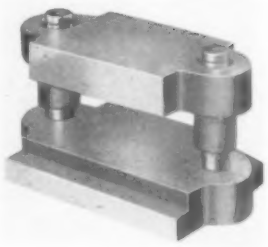


FIG. 6. **(below) and** ***FIGS. 7 and 8*** **(right). Die sets by Detroit Die Set Corporation. Fig. 6 illustrates one of the larger die sets, while Figs. 7 and 8 show, respectively, the standard Detroit center pin die set of semi-steel, and the corresponding all steel set.**

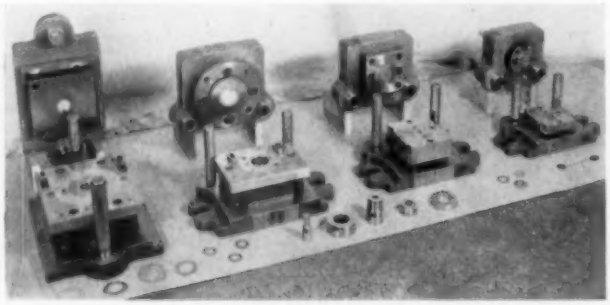


FIG. 5. **Universal Master Washer Dies, manufactured by Hovis Screw Lock Co.**

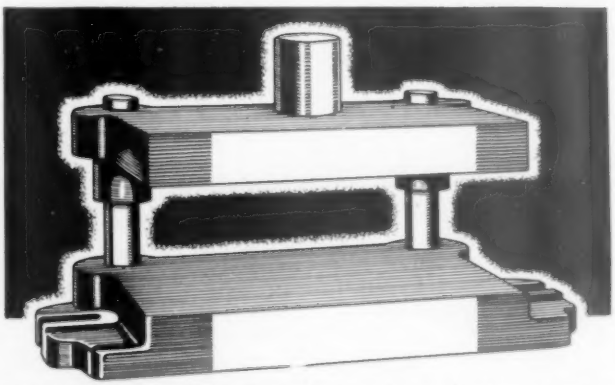
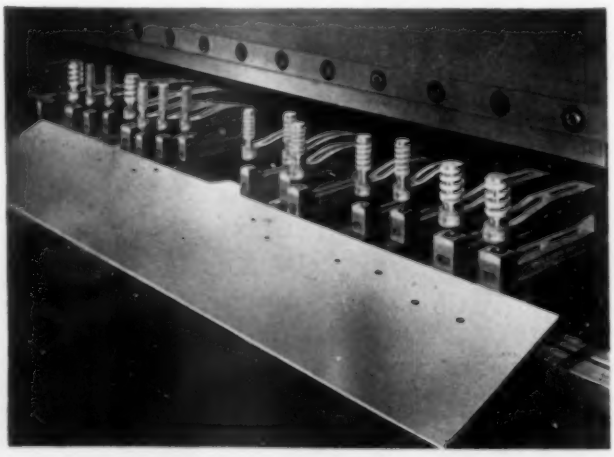
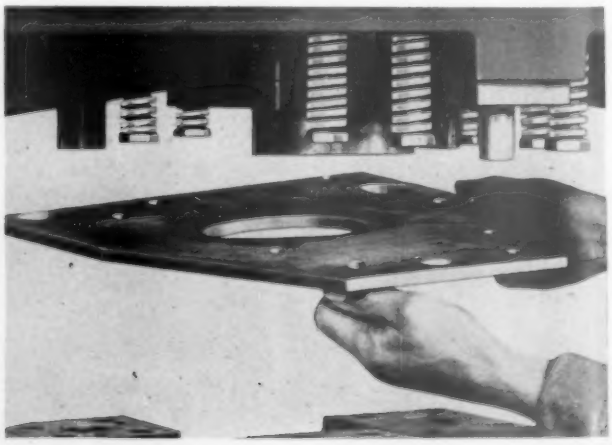


FIG. 10 **(below). Wales "Strippits," to be used wherever springs are required for stripping. These are of equal length and insure uniform stripping pressure.**

FIG. 9 **(below). Wales Type "BJ" hole punching units, with rated capacity of 1/4" thick material. Each unit is self contained, with punch, die and stripping mechanism.**





Figs. 6, 7 and 8 show die sets manufactured by Detroit Die Set Corporation, 2895 West Grand Blvd., Detroit 2. One of the intermediate sets, as used for automotive and kindred stampings, is shown in Fig. 6, while Figs. 7 and 8 show, respectively, the standard Detroit center pin die set, of semi-steel, and the corresponding all steel set.

Figs. 9 and 10 show hole punching and stripper units, product of Wales-Strippet Corporation, 345 Payne Ave., North Tonowanda, N.Y. The Wales-Strippet concern manufactures a very complete line of light and heavy duty hole punching units, with capacity up to ¼" thick in steel. These units are entirely self-contained and consist of holders that carry the punches, dies and stripping mechanism.

Figs. 11, 12, 13 and 14 show a few of the many standardized die specialties by Richard Brothers, division of Allied Products Corporation, 1560-74 Milwaukee Ave., Detroit 11. The standard composite die sections, Fig. 11, are inserts to be used in the manufacture of sectional dies and punches. Fig. 12, the R-B line of standardized round punches and piercing dies, with retainers. These punches and dies may also be had in ovals and odd shapes. They are held in standardized retainers, which are located to the punch holder or die, as the case may be, and dowelled and screwed into place. They are quickly inserted and attached, as shown by the sectional view, Fig. 13. Fig. 14 shows the R-B rubber strippers, adjacent to a standardized punch set. The rubber strippers are used where limited space precludes the use of spring strippers, with their incidental counterboring and recessing.

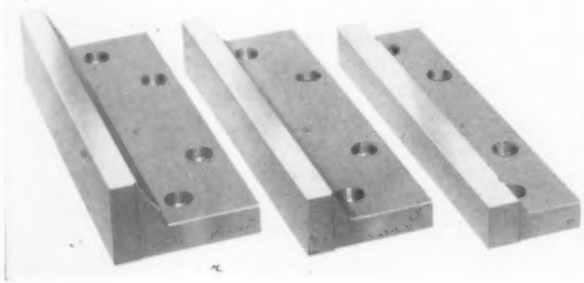
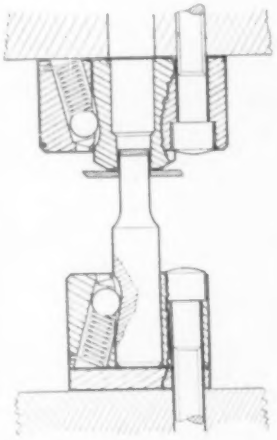
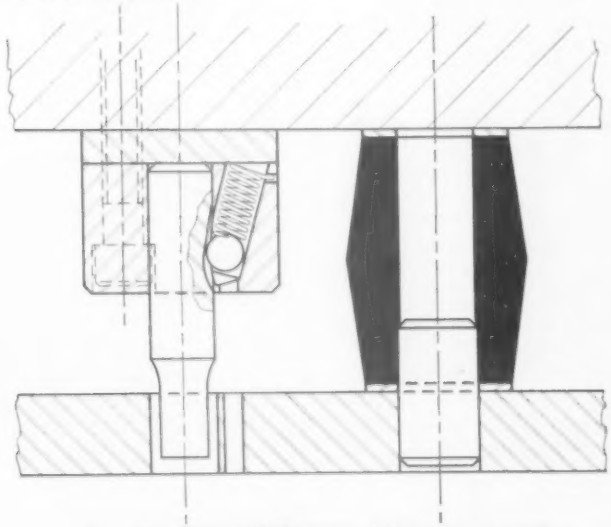


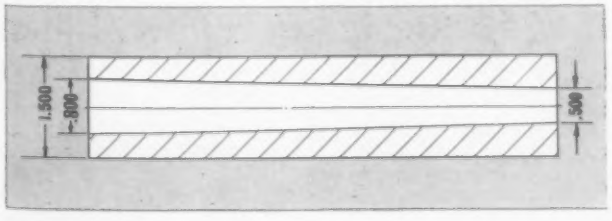
FIG. 11, left, Standard composite Die Section by Richard Brothers Company. *FIG. 12*, lower left, R.B. standard piercing die and punches, and *FIG. 13*, right, method of retaining and quick release. Retainers are square and located by dowels and held by screws. Punches and dies, in turn, are retained by spring held ball checks that securely wedge the units in place. A push on the ball, with a suitable tool, immediately released the punch or die, when a new one can be inserted.
FIG. 14, below. Standardized rubber strippers, by Richard Brothers. These rubber strippers are used where die thicknesses or limited shut height or stroke does not permit use of springs or counterboring of spring pockets.





The $64 Question.

Some time ago, Mr. Walter Dimitruk, 184 East 7th Street, New York 9, N.Y., suggested a Question and Answer column, to which the editor in turn suggested that Mr. Dimitruk start off with a question. And here it is, as described below: Is there any other way, without reaming with a tapered reamer or drill, of getting a tapered hole 7" long as per sketch? Mr. D. holds that the compound slide of an ordinary lathe is too short for boring a tapered hole that long. The method proposed must be inexpensive without resort to special or costly tools. Who has the solution?



A. S. M. Offers Veterans' Refresher Course

Returning veterans who entered the service from the metal industry are offered an exclusive program of free refresher courses by the American Society for Metals, whose headquarters are at 7301 Euclid Ave., Cleveland. According to W. H. Eisenman, national secretary of A.S.M., the object of the course is to bring the individual up to date on all new developments and processes that have taken place during his service. Specific phases of direct interest to veterans will be emphasized.

The program will operate through the various local Chapters of the Society, each of which will select a committee composed of experts in the field to be reviewed. For example, the veteran who was previously in the electroplating field will meet with wartime developments in electroplating and related methods. The service will be available, free, to all veterans previously in the metal industry, whether or not they are A.S.M. members. Requests for the course may be referred to Mr. Eisenman, Nat'l. Secretary of A.S.M.

By T. N. Armstrong and J. S. Vanick*

Nickel Steels, Cast Irons and Other Nickel Alloys Applied in Tool Engineering

Materials, their selection, uses and processing comprehensively defined by authoritative metallurgists.

THE advantage of nickel steels and irons for machinery components and for machine tool parts such as shafts, gears, cams and beds, are widely recognized but their application to tools, dies, jigs and fixtures is perhaps not so well known. In addition to the conventional types of nickel alloy steels and cast irons there are many special purpose nickel alloys which may be applied to advantage in tool engineering.

NICKEL ALLOY STEELS

The constructional types of low alloy steels may be divided into two general classifications—low carbon case hardening steels, and medium and high carbon oil hardening steels usually referred to as direct hardening.

T. N. Armstrong studied engineering at University of Kentucky. After two years of practical foundry training, he served seven years as metallurgist at the Norfolk (Portsmouth, Va.) Navy Yard. In '35 he joined the staff of the Development and Research Div'n of the International Nickel Company, on steel developments. He is author of technical articles on alloy steels and, in 1940, was awarded the Lincoln Gold Medal as co-author of a paper on welding.

CASE HARDENING STEELS

The case hardening steels are suitable for applications requiring high surface hardness (usually the maximum hardness obtainable in steel) combined with toughness, such as gears, arbors, collets and feed fingers. They combine hard, tough, wear resistant, non-spalling surfaces with cores strong enough to afford excellent support for the case and tough enough to resist shocks and overloads. The nickel case hardening steels respond to simple heat treatment while warping and distortion are minimized.

DIRECT HARDENING STEELS

The desirable combination of strength, fatigue, resistance, ductility, toughness, hardenability, consistent response to heat treatment and non-distortion inherent in the various direct hardening nickel alloy steels makes them suitable for many tool applications. The direct hardening steels provide greater core strength than the carburizing grades by virtue of their higher carbon content, but lack the peak wear resistance of the carburizing types.

FACTORS AFFECTING SELECTION

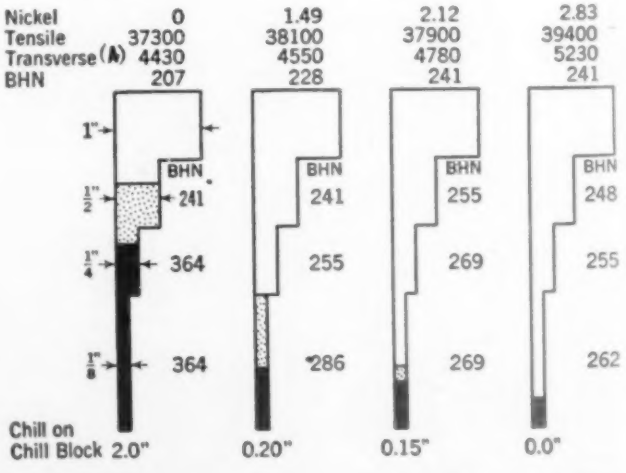
The reasons underlying the choice of any alloy steel for a specific part are two. The mechanical properties must of necessity be such that the part will satisfactorily meet its service requirements. Equally important are fabricating properties which will insure economical machinability with adequate accuracy and response to simple heat treatment with a minimum of distortion and freedom from cracking. Both these considerations are heavily dependent upon the cost involved, and naturally the cheapest steel which meets the desired requirements is the logical steel for the job.

In selecting alloy steel for tools and fixtures consideration must be given as to what steels are available. In normal periods most of the constructional steels are covered by the S.A.E. numbering system but due to the necessity of conserving alloys during war time a new series of alloy steels was devised under the designation of National Emergency Steels, commonly referred to as the NE grades. As these steels are alloyed with comparatively small amounts of the three principal alloys—that is, nickel, chromium and molybdenum—they are generally referred to as the triple alloy steels.

James S. Vanick is a graduate in Metallurgical Engineering from Case School of Applied Science, with an M.S. degree from George Washington University. In '17, joined British Ministry of Munitions as Test Engineer; later, was Research Associate in Metallurgy at U. S. Bureau of Standards. Since 1922, has been Research Metallurgist with International Nickel Company. Prominent in engineering circles, he is author of a number of papers on metallurgy and foundry practice.

The types first developed included NE-8600, 8700, 9400 and 9700 series and for the average application these steels have proven quite satisfactory. However, closer control in heat treatment is required than is true of the more highly alloyed SAE grades. The limitations of the original NE steels

FIG. 1. Hardening gray iron by adding nickel. The Step Bar Test. A-12" centers.



* Members of Staff, Development & Research Division, The International Nickel Company, Inc.

might be summed up in a lack of core strength for heavy duty carburized parts, and limited hardenability in the direct hardened grades. These deficiencies led to the development of the NE 9800 and 9900 types, both of which are considerably higher in nickel than the other grades.

One of the principal effects of alloying elements in the low alloy steels is the securing of higher hardness with slower cooling rates, or in other words increasing the hardenability. Different alloying elements affect hardenability to different degrees and some carry along other effects which may be undesirable. For that reason the selection of an alloy steel should depend not only upon its hardenability but also upon its ability to meet the specific service conditions as proven by past performance.

The constructional types of nickel alloy steels are listed in Table I. However, various grades of tool steels are usually sold under proprietary names.

FLAME AND INDUCTION HARDENING

Flame hardening is a method of hardening the surface of steel without affecting the properties of the core. The surface layers are heated by an oxyacetylene flame to a temperature slightly above the critical range and immediately quenched. Success of the method depends upon a very high rate of heat input so that only the surface is heated, and upon rapid cooling so that the heat does not have a chance to diffuse.

In the progressive method of flame hardening, quenching jets are usually in the burner head just behind the gas opening. By regulating the gas pressure and the rate of travel of the head the depth of hardening can be controlled. In the spinning method, the entire piece is rotated rapidly under the flames of one or more stationary blowpipes and the heated portion quenched while the part is still spinning.

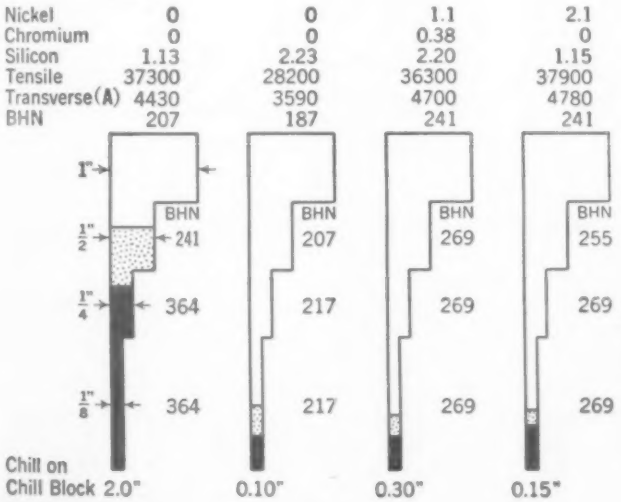
TABLE 1. COMPOSITION OF TYPICAL SAE AND NE NICKEL ALLOY STEELS

Steel No.	% Carbon	% Manganese	% Nickel	% Chromium	% Molybdenum
SAE 2317	0.15/0.20	0.40/0.60	3.25/3.75	.....	.....
SAE 2330	0.28/0.33	0.60/0.80	3.25/3.75	.....	.....
SAE 2340	0.38/0.43	0.70/0.90	3.25/3.75	.....	.....
SAE 2515	0.12/0.17	0.40/0.60	4.75/5.25	.....	.....
SAE 3115	0.40/0.60	0.40/0.60	1.10/1.40	0.55/0.75	.....
SAE 3135	0.33/0.38	0.60/0.80	1.10/1.40	0.55/0.75	.....
SAE 3141	0.38/0.43	0.70/0.90	1.10/1.40	0.70/0.90	.....
SAE 3240	0.38/0.45	0.40/0.60	1.65/2.00	0.90/1.20	.....
SAE 3312	0.08/0.13	0.45/0.60	3.25/3.75	1.40/1.75	.....
SAE 4320	0.17/0.22	0.45/0.65	1.65/2.00	0.40/0.60	0.20/0.30
SAE 4340	0.38/0.43	0.60/0.80	1.65/2.00	0.70/0.90	0.20/0.30
SAE 4615	0.17/0.22	0.45/0.65	1.65/2.00	.....	0.30/0.30
SAE 4640	0.30/0.43	0.60/0.80	1.65/2.00	.....	0.20/0.30
SAE 4820	0.18/0.23	0.50/0.70	3.25/3.75	.....	0.20/0.30
NE 8620	0.18/0.23	0.70/0.90	0.40/0.70	0.40/0.60	0.15/0.25
NE 8640	0.38/0.43	0.75/1.00	0.40/0.70	0.40/0.60	0.15/0.25
NE 8720	0.18/0.23	0.70/0.90	0.40/0.70	0.40/0.60	0.20/0.30
NE 8740	0.38/0.43	0.75/1.00	0.40/0.70	0.40/0.60	0.20/0.30
NE 9420	0.18/0.23	0.80/1.10	0.30/0.60	0.30/0.50	0.08/0.15
NE 9445	0.43/0.48	1.00/1.30	0.30/0.60	0.30/0.50	0.08/0.15
NE 9450	0.48/0.53	1.20/1.50	0.30/0.60	0.30/0.50	0.08/0.15
NE 9722	0.20/0.25	0.50/0.80	0.40/0.70	0.10/0.25	0.15/0.25
NE 9745	0.43/0.48	0.50/0.80	0.40/0.70	0.10/0.25	0.15/0.25
NE 9840[1]	0.38/0.43	0.70/0.90	0.85/1.15	0.70/0.90	0.20/0.30
NE 9915[2]	0.15/0.20	0.50/0.70	1.00/1.30	0.40/0.60	0.20/0.30

(1) *The 9800 series made only in direct hardening grades.*

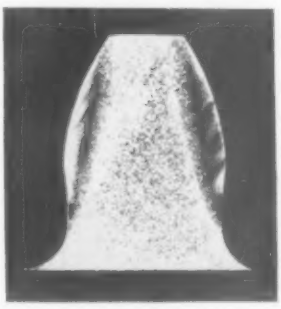
(2) *The 9900 series made only in case hardening grades.*

FIG. 2. **Hardening gray iron by nickel and chromium in balanced ratio, and comparison of Ni-Cr with Ni Cast Iron. The Step Bar Test. A-12" centers.**



APPLIED TO SELECTED SURFACE AREAS

Electrical induction hardening is similar to flame hardening in that the process is generally applied to harden only selected areas of the surface. Heat is applied through the medium of a high frequency induced current and the part quenched, usually through jets in the heating dies, immediately after the surface layers have been heated above the critical temperatures.



Etched cross section of a gear tooth, of nickel alloy, is clearly illustrative of the flame hardened areas.

Nickel alloy steels are excellently suited to both of these processes. The high core properties of the surface hardened nickel alloy steels provide adequate support for the case, high fatigue strength and excellent toughness. Such parts as pump liners, crane wheels, sheaves, gear teeth, machine ways, crankshafts, camshafts and many other parts made of nickel alloy steels have been successfully hardened by these methods.

NICKEL CAST IRONS

A great deal of progress has been made toward improving the properties of cast iron by alloying, so that today it is possible to procure cast irons ranging in strength from 20,000 to 60,000 pounds per square inch and possessing other related desirable properties which fit them admirably for the tool engineers' needs.

EFFECT OF NICKEL

By means of nickel additions, it is possible to improve the machinability, also the structure and the uniformity of castings, particularly where changes in cross-section occur, which tend to upset these properties in ordinary cast irons. By means of small additions of nickel pressure tightness and density of a cast iron can be increased, while simultaneously the micro-structure and uniformity of the metal are improved, so that machined surface finishes are smoother and the product lends itself readily to polishing and scraping operations. Castings such as surface plates, angle plates, lapping plates, jigs, and fixtures, as well as bushings, sleeves, bearings and miscellaneous machine tool parts are usually made from this type of iron. Specifications A-7 and A-21 in Table 2 are typical of the material employed.

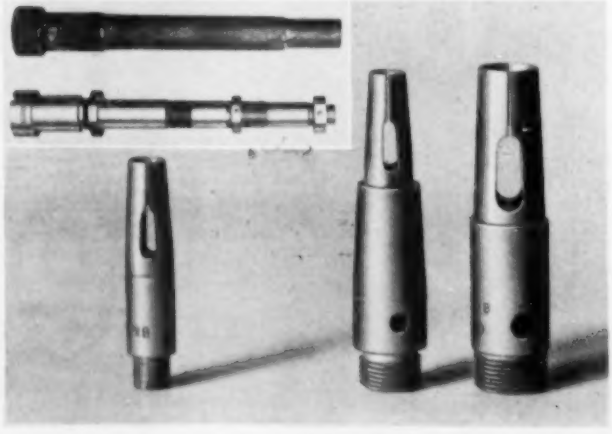
NICKEL-CHROMIUM IRONS

It is common practice for a foundryman to treat what is called his "hard" iron with nickel additions to produce a machinable product of high strength and density, because the hard irons in general are stronger and denser in their unalloyed conditions. In Fig. 1, the unmachinable (black) areas have receded showing how the hard dense iron can be successfully used to produce a strong, machinable product. Such irons inherently possess a better resistance to wear than the soft and mushy types. They are frequently used for such machine tool parts as beds, saddles, columns, tables and spindles; also for small gears, gear cases, cylinder liners, pistons, hydraulic valve bodies, etc. Specification A-21 covers iron of this type.

TABLE NO. 2. AN ABRIDGED TABLE OF NICKEL CAST IRONS USED IN TOOL ENGINEERING

Type		Will Meet ASTM Class	Typical Composition						Tensile Strength	Purpose
Inco Spec.	Description		Total Carbon	Silicon	Nickel	Molyb-denum	Chrom-ium	Maximum Molyb-denum Chromium		
A-21	Fine Grained, Dense, Fast Machinable, Wear Resistant	30	3.50	1.80	1.50	....	.30	.30	35,000	Wear, Machinability, Pressure, Tightness
A-7	(Same as above)	35	3.30	1.80	1.25	....	....	...	35,000	(Same as above)
A-17	Hard, Strong	45	3.30	1.50	2.75	....	.60	.60	45,000	Compression, Wear
A-41	Uniform, Machinable	40	3.30	2.10	1.50	.40	.20	.60	40,000	Pressure, Wear
A-29	Close-Grained, Tough, Wear Resistant	45	3.10	1.50	1.25	....	.30	.30	45,000	Wear, Heat Resistant, Pressure
A-49	High Strength, Machinable, Dense	50	2.90	1.70	1.50	....	.20	.60	50,000	Wear, Pressure, Impact
K-21	High Strength, Tough	60	2.85	2.20	1.50	.60	....	.60	65,000	Impact, Strength, Faiaue Resistant
	SPECIAL CAST IRON									
K-18	Non-Magnetic	25	2.80	1.50	14.00	6.00 (CU)	2.00	...	25,000	Non-Magnetic, High Expansion
K-17	Low Expansivity	20	2.50	1.25	36.00	....	4.00	...	20,000	Dimensional Stability
K-2	Abrasion Resistant, Machine by Grinding	..	3.20	.50	4.50	....	1.85	...	.....	Wear "as Cast"

Upper left. Rough-forged and finish-machined spindle of SAE 3145 Ni-Cr Steel. (Johnston & Jennings Co., Cleveland, Ohio). Below, Nickel steel feed fingers manufactured by Eastern Machine Screw Corp. of New Haven, Conn.



When a higher order of wear resistance is desired it is customary to treat a cast iron with nickel and chromium additions in the ratio of about three parts of nickel to one part of chromium. Fig. 2 illustrates how a soft iron so treated can be improved in strength and structure. The improvement in structure is registered by the slightly higher hardness shown, and since this improved hardness has been achieved by the use of a balanced addition of nickel and chromium, an improved resistance to wear results. Chromium possesses a high affinity for carbon so that when it is added alone to a cast iron, localized hardened areas may result which interfere with smooth finishing and machining. When the chromium addition is supplemented by twice or three times as much nickel, this undesirable effect is kept in check while its valuable property of contributing toward hardness is realized. By means of nickel-chromium additions ranging from .60% nickel—.20% chromium, up to 3.00% nickel—1.00% chromium, it is possible to produce wear resisting castings ranging in type from small gears, pulleys and cylinder liners to heavy castings such as dies and cams.

NICKEL-MOLYBDENUM IRONS

Nickel-molybdenum additions to cast irons are employed to develop a combination of high strength and toughness. Cast irons containing 1.00% nickel and .30-.75% molybdenum will develop tensile strengths exceeding 60,000 pounds per square inch and retain machinable structures throughout this improved range of strength. The alloy addition is again larger for the heavier castings and thicker sections.

Along with the high strength, these cast irons acquire an appreciable degree of toughness which is registered in their ability to develop up to three times more transverse deflection than is obtainable in ordinary cast irons.

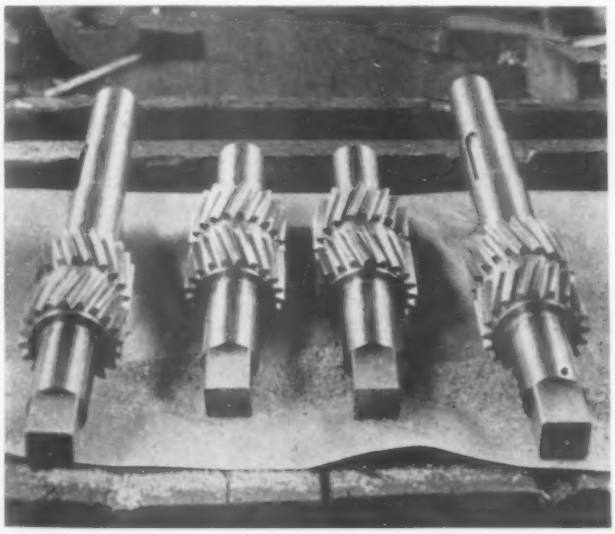
Impact tests upon this family of nickel-molybdenum alloy cast irons similarly register a greater shock resistance. Specifications A-49 and K-21 are for cast irons of this type. Crankshafts, gears, pressure castings, tool shanks, holders and bodies, and machine parts requiring high strength represent common applications.

HEAT TREATMENT OF CASTINGS

All of these cast irons can be given about 15,000 to 25,000 pounds per square inch *additional* tensile strength by quenching them in oil from a temperature of about 1600° F. and tempering them by reheating to around 900°F.

Where a high hardness is preferred rather than high strength, the castings can be quenched in the same way, but tempered at 400-500° F. to relieve them of quenching stresses. Castings that are to be heat treated should be symmetrical and uniform in section, with no cored-out recesses or cavities so as to avoid building up stresses on quenching that would induce cracking.

Nickel steel pinions for machine tools, manufactured by Niles-Bement-Pond Corp., Hartford, Conn.



STRESS RELIEF—AGEING

It has been the custom in the past to eliminate stresses in castings by allowing them to age or weather for periods ranging from thirty days to one years. A more positive and rapid method consists of carefully heating such castings to temperatures of 900° to 1050° F. and slowly cooling. At this temperature range the metal becomes sufficiently mobile to dissipate any accumulation of stress, and on slow cooling no new stresses are introduced, so that the casting retains its shape permanently thereafter. Precision tool frames and many small castings which must possess a high degree of accuracy in their application and permanence in dimensions, are commonly heat treated with this low temperature stress relief anneal, which eliminates any subsequent risk of distortion without lowering the normal strength and hardness.

STAINLESS STEELS and NI-RESIST

Some application has been made of the stainless steels in tool engineering. There are many grades of austenitic chromium-nickel stainless steels but the most popular type is one containing not over .20% carbon and approximately 18% chromium and 8% nickel (A.I.S.I. Type 302). This steel

Housing for jig borer cast in "Minvar" low expansion 35% Ni - 2% Cr balance iron alloy to assure accuracy which would be otherwise impossible due to frictional heat causing thermal expansion of the head during operation. (Moore Special Tool Co., Bridgeport, Conn.)

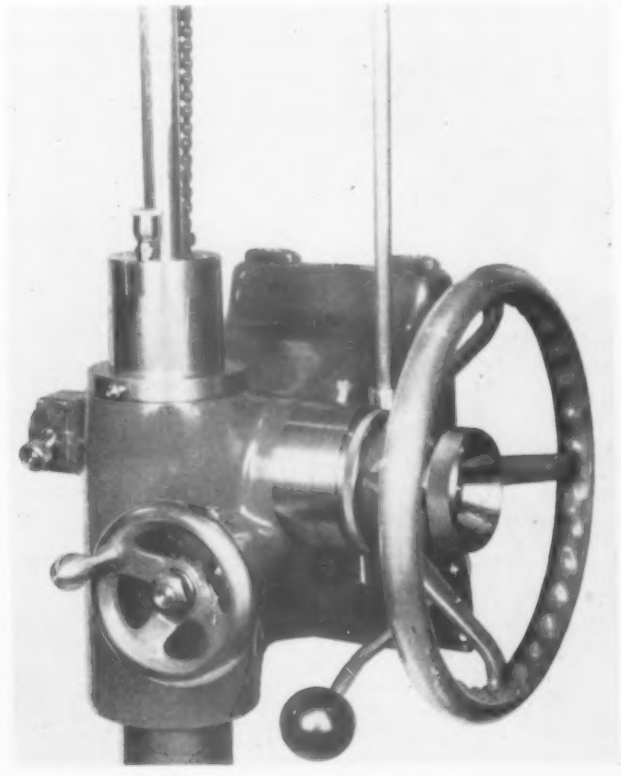


TABLE NO. 3 PROPERTIES OF NON-FERROUS NICKEL ALLOYS SUITABLE FOR TOOLS

Alloy	Form	Treatment	Yield Point (0.2% Set) Lbs./Sq. In.	Tensile Strength Lbs./Sq. In.	Elongation % in 2"	Brinell Hardness Range
"K" Monel	Wrought	Heat Treated	100,000-115,000	140,000-155,000	35-20	265-310
		Cold worked and heat treated.	100,000-130,000	145,000-165,000	35-15	290-375
"Z" Nickel	Wrought	Heat Treated	120,000 min.	160,000 min.	10 min.	300-350
		Cold worked and heat treated	140,000 min.	180,000 min.	7 min.	350-400
"H" Monel	Castings	As Cast	45,000-65,000	70,000-90,000	20-10	170-210
"S" Monel	Castings	As Cast	75,000-95,000	90,000-115,000	3-1	280-325

has excellent forming properties and responds well to spot welding and metal arc welding. It does not harden on heat treatment but may be hardened by cold working. It is an excellent material for resisting corrosion in many types of environment. Because of its high strength properties, particularly in the cold rolled condition, it lends itself readily to light weight construction.

An important family of cast iron base alloys is the Ni-Resist ** series which contain 15 to 40% nickel. As in stainless steel, this amount of nickel improves the corrosion resistance of the iron, but in the tool room the product is principally useful for its low expansivity and its non-magnetic quality.

NON-FERROUS ALLOY TOOLS

While most tools are made of ferrous alloys, there are many specialized applications for which non-ferrous alloys would be the most logical choice. For working in some corrosive environments such materials as "K", "S" and "M" and "Z" Nickel have distinct advantages. In addition, these alloys have low sparking characteristics which make them safer to use in locations where sparking might ignite highly inflammable or explosive materials.

LOW EXPANSION ALLOYS

For gages and fixtures used in conjunction with parts that require dimensions finished to extremely close tolerances, alloys with low thermal expansion characteristics have been useful. Perhaps the best known are alloys of the Invar type which contain approximately 36% nickel (balance iron) with a small percentage of impurities. Over a range of normal atmospheric temperatures the expansion is about one-sixth that of carbon steel.

By adjusting the nickel/iron ratio, expansion characteristics can be developed which are similar to those of many different metal and non-metallic materials. Nickel affects the expansion characteristics of cast iron similarly to its effect on steel. It is the only alloying element that influences this property over a wide range of values. Expansivity of cast iron can thus be made half normal or 50% greater than normal, depending upon the amount of nickel used.

At 30-36% nickel, the expansivity is at a minimum and less than half that of cast iron or steel. This makes it admirably suited for applications requiring high accuracy and dimensional stability, etc. Special tools such as the housing and spindle head of jig borers and jig grinders, heads and bearings in grinders, boring machines, etc. that become heated during operation, gages, frames for optical equipment, etc., are typical applications.

When the nickel content is cut from 30-36% into the range of 18-22%, a Ni-Resist type alloy, of *high* expansivity is produced. At 20% nickel, the expansivity is 50% greater than that of cast iron. This becomes useful in assemblies where the high expansivity of aluminum alloys must be matched by a material working with it. Engine cylinder sleeves in aluminum blocks, valve guides in aluminum heads, Ni-Resist wearing surfaces on aluminum bodies are typical of this application.

MAGNETIC ALLOYS

Nickel is an essential element in a series of alloys possessing high magnetic properties which in the past few years have become recognized as the best permanent magnet materials now commercially available. The best known of these alloys is Alnico (No. IV., 28% Ni, 12% Al., 5% Co.). The largest use of permanent magnets as applied to tools is in "non-electric" magnetic chucks. Such chucks require no electrical connections, wires, switches, or sources of power. They are simple in construction, possess only one moving part, do not heat up in service and are adapted to wet as well as dry grinding. They are easily portable and the "on" or "off" control is obtained with a crank.

Conversely, an important property of the 20% nickel type Ni-Resist mentioned above is its non-magnetic quality. This has been utilized in the manufacture of magnetic chucks by providing a magnet insulating material to surround the magnetic coils, so that when the magnetic circuit is cut the chuck lets go promptly.

APPLICATIONS

In discussing applications of nickel alloys in tool engineering both the NE and SAE steels are included as both types have been widely used. In the following paragraphs some of the most frequent applications of nickel steels and irons and other nickel containing alloys are discussed briefly.

** (Reg. U. S. Patent Office. The International Nickel Company, Inc.)

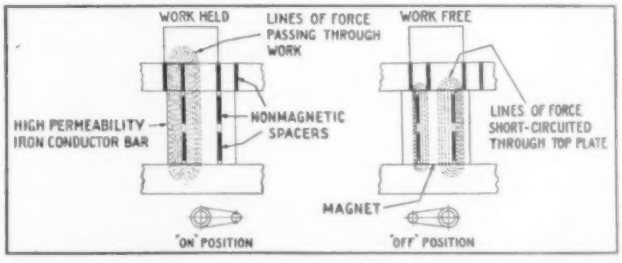
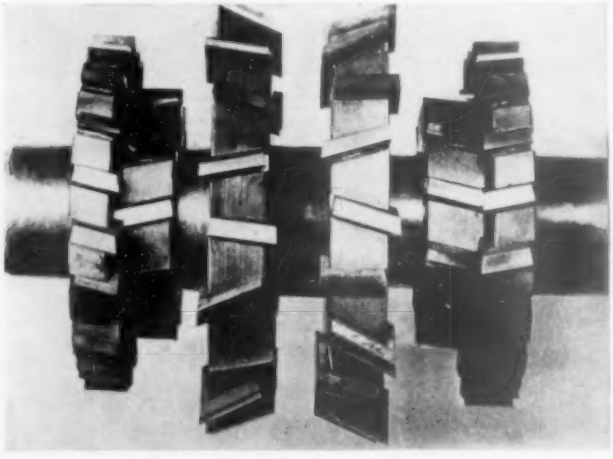


Diagram showing the operation of "Alnico" permanent magnets in the Brown & Sharpe chuck.

Typical tool shanks and milling cutter bodies of Ni-Cr-Mo cast iron. (The Arpocalloy Co., Kansas City, Mo.)

Inserted tooth milling cutter bodies of SAE 3135 Ni-Cr steel.



Demagnetizer for use with magnetic chucks on machine tools. Ni-Resist is used in the casing because of its non-magnetic properties.

APPLICATIONS

DIES

The success of nickel-chromium-molybdenum steel for drop hammer die blocks has been so outstanding that it is almost the universal choice for this application. The factors responsible include high hardenability (depth hardening), resistance to heat checking, great toughness, machinability and resistance to wear resulting in longer production runs per block. Nickel-chromium-molybdenum-tungsten steels, some of which are modified with vanadium, have given very good service in mandrels, dies and containers of presses for extruding aluminum, brass and high nickel alloys. Nickel alloy steels are also used for die casting and for molding plastics. Some of the most popular types are shown in Table 4.

Nickel cast iron has been used extensively for forming dies. Large dies measuring as much as 12″ in thickness should be rather highly alloyed in order to counteract the slow cooling through which these large masses pass after the metal has been cast in the mold. Specification A-17 (Table 2) applies to an iron of this type which can provide machinable hardness as high as 300-350 Brinell and substantial improvements in resistance to wear are realized at this high hardness level. Heavy cams, anvil blocks and similar heavy castings are made of the same type of iron as that recommended for dies.

TABLE NO. 4—NICKEL STEELS AND IRONS FOR DIES

Automobile body and sheet metal work	Cast Iron Type A-17	As Cast or Heat Treated
Blanking	SAE 4335, SAE 3250	Oil Hardened
Cold Heading	Ni-W—SAE 4335	Oil Hardened
Die Casting	SAE 8650—Ni. Tool Steel	Oil Hardened
Deep Drawing	Ni-W	Oil Hardened
Drop Forging	SAE 4335—SAE-4355	Oil Hardened
Forming	Nickel Cast Iron Types SAE 3250	As Cast or Heat Treated Oil Hardened
Hot Work	Nickel Tool Steel	Oil Hardened
Plastic Molding	SAE 3312, SAE 3110, Nickel Ingot Iron	Case Hardened
Pressing and Stripping	Nickel Cast Iron Type	Heat Treated

FIXTURES

Arbors and collets are sometimes made of direct hardening nickel-chromium-molybdenum steels. While surface hardness as great as that of a case hardened steel cannot be obtained, these steels can be treated to relatively high hardness without becoming brittle. By thus eliminating carburizing operations, the cost of heat treatment is reduced and handling is simplified.

The desirable properties and ease of processing make the direct hardening nickel alloy steels suitable for many other tool applications such as boring bars, calking tools, ring and thread gages, hammer heads, hobs, punches, hydraulic rams, etc.

Specification A-41 (Table 2) is typical of a nickel cast iron used for the lighter weight, thinner sectioned castings such as tool shanks, holders and bodies, cylinder liners, pistons, small gears, pulleys, lightweight machinery frames and housings, valve pump and other castings subjected to fluid pressure. Plug gages and thread gage plugs, etc. are also made from this type of iron and heat treated by quenching and tempering to a high-wear-resistant hardness. Specification A-29 is typical of the iron used for heavier, thicker sectioned castings of the same kind as those just mentioned. Large gears, heavy machinery parts, cams, flywheels, and so on are also frequently made from the A-41 type.

Special irons such as Ni-Hard and Ni-Resist composition find special application in the tool rooms. Ni-Hard, which is an abrasion resistant and unmachinable hard iron, has been proposed for gage bodies. Its composition is shown in the Table under Specification K-2.

"Paralloy" dies of 3½% Ni-0.75% Cr cast iron, produced by Youngstown Foundry & Machine Company. Used for making washing machine parts.

Plastic mold dies, made by hubbing process of "Plastalloy" nickel alloy steel produced by Henry Disston & Sons Co., Philadelphia, Pa.

TABLE NO. 5—NICKEL STEELS AND IRONS FOR JIGS & FIXTURES

Arbors	NE 8620, 8720, SAE 4615, 3120 * High Carbon Ni-Cr-Mo	Case Hardened Oil Hardened
Boring Bars	NE 8645, NE 9845 * High Carbon Ni Cr.	Oil Hardened Oil Hardened
Collets and feed fingers	NE 8620, NE 8720, SAE 4620 * High Carbon Ni-Cr-Mo.	Case Hardened
Hobs	SAE 3330, NE 9835	Oil Hardened
Milling and Reaming Cutter Broaches	SAE 3330, NE 9835	Oil Hardened
Mandrels	NE 8745, 9845, SAE 3145, 4340, 3250	Oil Hardened
Shafting	NE 8620, 9920, SAE 4615, 3120, 3312	Case Hardened
	NE 8640, 9440, 9840, SAE 4340, 3240	Oil Hardened
Tool and Cutter Bodies	NE 8620, 9920, SAE 4615, 3120, 3312	Case Hardened
	NE 8640, 9440, 9840, SAE 4340, 3240	Oil Hardened
* Usually tool steel grades	Nickel Cast Iron A 41	As cast or Heat Treated

HAND TOOLS

For most hand tool applications steel is used in the quenched and tempered condition, and as presence of nickel permits slower cooling rates for effective hardening, milder coolants can be used than with carbon steel, resulting in reduction of internal stress, warpage and distortion, and liability to quench cracking. In addition the lower critical cooling rate permits effective hardening in heavier sections.

WRENCHES

In general all wrenches are required to apply a torque for a twisting moment to a threaded joint. Not infrequently, however, wrenches pinch hit for hammers, crow bars, jimmies or other service for which they were never intended. Hence it is desirable to build into such a general utility tool a generous margin of strength and toughness. This should not be accomplished at the expense of making the tool overheavy or bulky, which would be unduly fatiguing to the operator. For these reasons the medium carbon direct oil hardening nickel alloy steels are well suited to wrench manufacture, producing strong, tough and durable tools, light in weight and designed for maximum flexibility.

HAMMERS

The characteristics desired in most types of hammers are the ability to impart a blow without denting or deforming (mushrooming) the head, and sufficient toughness to resist spalling or breakage. These requirements are met without difficulty by using direct hardening nickel alloy steels. For certain types, however, where an exceptionally hard striking surface is required a case hardened steel may be used.

SCREW DRIVERS

Screw drivers, like wrenches, are likely to be abused. Not infrequently a wrench will be used on a screw driver in loosening a rusted screw and more frequently than not the tool is used for a cold chisel or pry bar. Though admittedly not designed for such service, it must be assumed that a large percentage of screw drivers will be subjected to such rough treatment. Tool makers have met this problem by employing nickel alloy steels because they provide the necessary toughness and ductility at high strength and hardness levels.

TABLE NO. 6—NICKEL ALLOY STEELS FOR HAND TOOLS

Hammer Heads	NE 8645, SAE 3145, SAE 4645	Oil Hardened
Nippers and Pliers	NE 8620, NE 9920, SAE 4615, SAE 3312	Case Hardened
Screw Drivers	NE 8650, NE 9445, SAE 4650, SAE 3150	Oil Hardened
Wrenches	NE 8645, NE 9840, SAE 4650, SAE 3150	Oil Hardened

PLIERS AND NIPPERS

These tools constitute a class which are required to perform a number of different operations. Jaws must be hard and wear resisting without being brittle, handles must be strong and tough to resist bending stress, and the cutting types must have durable cutting edges. In order to meet all of these requirements many high grade pliers and nippers are made of case hardened nickel alloy steels. The use of these steels and this type of treatment insures adequate strength and toughness in the body of the tool while the jaws and cutting edges possess the requisite hardness, together with toughness, fatigue and wear resistance and the lack of susceptibility to spalling or chipping which is essential to an efficient and durable cutting edge.

CHISELS, PUNCHES AND RIVET SETS

Nickel alloy steel chisels have been outstanding for some types of service in rivet busters. Another outstanding application was in welding shanks of low carbon nickel steel to high carbon tool steel tips in pavement breaking service.

For punches the improved toughness of nickel steels has proved particularly helpful when the punch in operation is subjected to side thrust.

Rivet sets differ from chisels and punches in that no cutting ability is required. Great hardness and strength are necessary to resist deformation and these qualities must be combined with toughness and fatigue resistance to withstand repeated impact blows. The optimum combination of these characteristics is realized in the nickel case hardening steels. If a direct hardening steel is preferred the same types that serve for chisels and punches work very well.

TABLE NO. 7—NICKEL ALLOY STEELS FOR MISCELLANEOUS TOOLS

Caulking Tools	NE 8640, SAE 3340	Oil Hardened
Chisels	NE 8655, SAE 3240, SAE 3340	Oil Hardened
Hacksaw Blades	* Ni—W	Oil Hardened
Hot Shear Knives	SAE 4345	Oil Hardened
Punches	NE 9850, SAE 3250, SAE 3340 * High Carbon Ni Cr.	Oil Hardened
Saws: Bands	* High Carbon Ni	Oil Hardened
Saws: Circular	* High Carbon Ni	Oil Hardened
Saws: Circular Center	NE 8630	Not Heat Treated
Saws: Discs		
*Usually Tool Steel Grades.		

"Allenoy" (nickel bearing) socket screws and wrenches, made by Allen Mfg. Co.

By **Bertram B. Caddle**

Machine Forging of Non-Ferrous Metals

Corrosion resistant, and with physical properties close to steel, non-ferrous metals may be die forged to shapes

WHILE metals other than copper were known to primitive man, copper alone was sufficiently ductile to be worked with the crude methods then available. And without doubt, it was hand forged long before any attempt was made at casting. Outside of utensils of clay, wood and bone, then, and artifacts of stone, cold or hot forged tools and weapons, of copper, were among the first of "manufactured" products —at least, the first of metallic goods.

Bertram B. Caddle was born in Wheeling, W. Va., where he was graduated from Elliott Business College. After spending several years in editorial work and as War Correspondent for the New York Herald, in 1921, became a member of the staff, and later Secretary, of the Copper & Brass Research, Brass Forgings Association.

This early working evolved into the Bronze Age, which began about 2000 B.C. and which seems to have had its initial development among the Etruscans and Egyptians. By the 16th century, B.C., casting of copper and bronze had developed into a high art, and both large and small objects, produced at that time, compare favorably, in artistry and execution, with the best of contemporary objets d'art. If we are to credit the "hard" copper of the Roman era, at least one development of that time is now among the lost arts.

While hand forging of copper alloys dates back to a remote age, however, brass forging by machine was born and cut its eye teeth during World War I. During that war, many of the great brass mills of this country constructed new buildings and equipped them with powerful presses with which to make forgings for the Army and Navy.

After the cessation of hostilities and the signing of the Versailles treaty, the manufacture of non-ferrous forgings, both brass and aluminum, became widely used by a diversity of commercial industries. Thousands of different types of forgings were manufactured for peacetime use between World War I and the outbreak of World War II.

These forgings were in great demand and the Industry rapidly expanded so that, when Pearl Harbor precipitated America's entry into the war, the non-ferrous forging plants were not only prepared to put all of their resources at the disposal of the Government, but worked the clock 'round to meet the demands of the Army, Navy and Air Force, as well —as to supply vital materials to others among the United Nations.

The "Why" of Non-Ferrous Forgings

Forging, of non-ferrous metals, has the same end as the forging of iron and steel. The metal becomes denser and tougher, and therefore stronger. Forgings have a much higher tensile strength than have castings. Porosity is eliminated and shapes can be held to such close limits of tolerance that subsequent machine operations, when and where necessary, are required only for mating parts or surfaces. This uniformity also greatly facilitates holding by chucks or fixtures.

Shapes are limited only to the skill and ingenuity of the diemaker, and applications are as diversified as the products themselves. They are corrosion resistant, hence, are in great demand as marine accessories as well as for combination with mating ferrous parts where non-corrosive joints are required. Their superior characteristics and wide range of shapes and

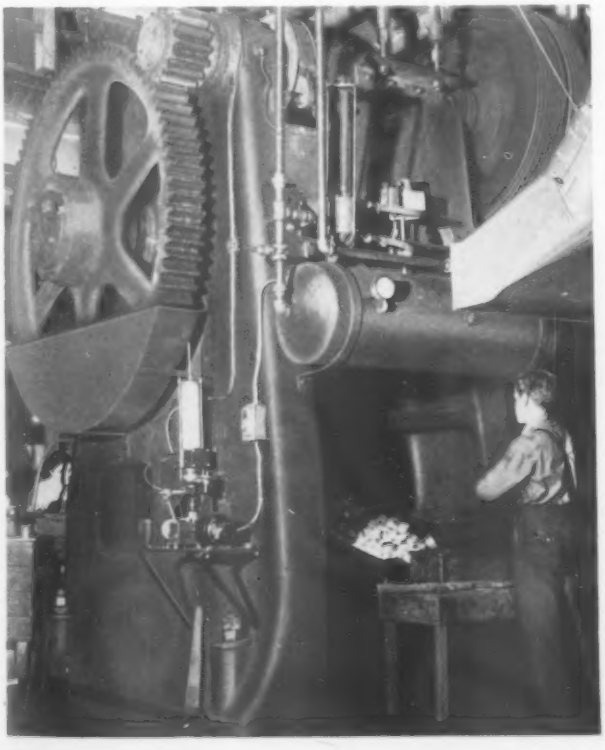


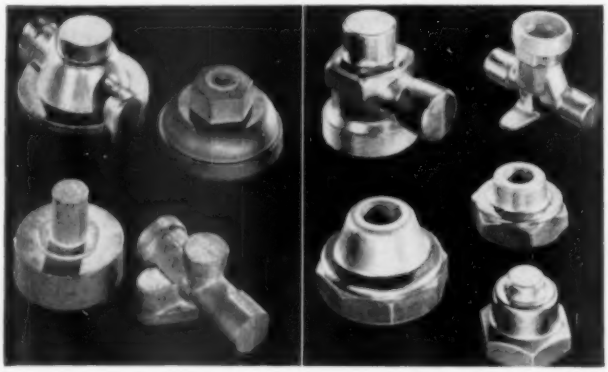
FIG. 1, left. 1000 ton Erie Brass and Aluminum Forging Press.

FIG. 2. Machining a forging die in a die sinking machine.

overall economy make them prime favorites for many uses. Forgings, used in wartime, must be tough because they must withstand the terrific vibration and shock encountered in tanks, jeeps, half-tracks, bombers and torpedoes, as well as the impact of shells, time fuses and other parts of projectiles. Until the unconditional surrender of Japan, non-ferrous forgings were principally used for war armament by the United States, Great Britain and the other Allies. Now that hostilities have ceased, however, forgings will again be available for peacetime industries.

Both Brass and Aluminum forgings are made by highly technical and industrially exacting hot working, in hammers and presses, of suitable slugs which are cut from ingots or rods. These operations make a strong, dense metal product which very closely approximates the size and shape of the finished item. Forgings are furnished either cleaned, trimmed, pierced, sized and otherwise free of excess forging material, and ready for machining or further finishing and fabricating operations.

FIG. 3. (Left). Top left, lower right, Refrigeration forgings; lower left, upper right, Flush Valve Forging and Cap.
FIG. 4. (Right). Miscellaneous valve bodies and caps.



Forgings can also be finished or machined completely processed and ready for use as an item—as, for instance a nut or tee—to be incorporated in assemblies such as automobiles, hardware and other material. With porosity eliminated, they are leak-proof and therefore highly favored for valves and valve seats. The physical properties are close to steel without the disadvantage of rust because neither Brass or Aluminum can rust and therefore effectively withstands corrosion.

The composition and properties of copper alloy forgings are shown in Data Table 1,* below. It will be noted that copper runs from 58.5% (lowest) in maganese bronze to 96% for silicon bronze, and that the zinc content averages about 30%, where used as an alloy. Tensile strength is surprisingly high, ranging from 40,000 lbs. p.s.i. for type B. silicon bronze to 65,000 lbs. for maganese bronze.

In Data Table 2,* (next page) is shown the mechanical properties and nominal chemical composition for aluminum alloy forgings. Here, ultimate strength is somewhat lower than for the copper alloy forgings, although 14 S-T compares favorably (65,000 lbs. p.s.i. with manganese bronze. This alloy, incidentally, has the highest maganese content—0.8 per cent—as has the 25 S-T, with ultimate strength of 55,000 lbs. p.s.i.

* The Data Tables and Photographs by courtesy of the Brass Forging Association, 420 Lexington Avenue, New York 17, N.Y.

DATA TABLE 1

ALLOYS COMMONLY USED FOR NON-FERROUS FORGINGS

Alloy	Composition (Commercial Limits-%)		Density (Lb. per Cu. In.)	Tensile Strength (1" Soft) (Lbs. per Sq. In.)	Elongation in 2 In. (Per Cent)	Rockwell Hardness	Best Annealing Temp. °F
FORGING BRASS	Copper Lead Zinc	60. 2. 38.	.305	52,000	45	F78	800–1100
NAVAL BRASS	Copper Tin Zinc	60. 0.75 39.25	.304	57,000	47	B55	800–1100
LEADED NAVAL BRASS	Copper Lead Tin Zinc	60. 1.75 0.75 37.5	.305	57,000	40	B55	800–1100
MANGANESE BRONZE	Copper Iron Tin Zinc Manganese	58.5 1.0 1.0 39.2 0.3	.302	65,000	33	B65	800–1100
MUNTZ METAL	Copper Zinc	60. 40.	.303	54,000	50	F80	800–1100
SILICON BRONZE, TYPE A	Copper Silicon	94.8 3.0	.308	58,000	60	B60	900–1300
SILICON BRONZE, TYPE B	Copper Silicon	96.0 Min. 1.5	.316	40,000	50	F55	900–1250

FIG. 5. Machining valve bodies on gang drill.

FIG. 6. Machining Brass Forgings on a New Britain Automatic.

However, aluminum alloys are considerable lighter than the copper alloys, therefore, one could considerably increase cross sections, per unit of bulk, to obtain greater strength and yet have a considerable advantage in lightness. However, properties of non-ferrous alloys are being constantly improved, and this, together with improved techniques of manufacture as well as improved forging equipment, will greatly enhance their use in the consumer goods field.

The illustrations for this article vividly portray some of the operations, in forging, from the giant presses used, and various machining operations as well as rough and finished forgings. Fig. 1, which shows an Erie 1000 ton press used to forge comparatively small forgings, gives an idea of the powerful equipment required. Fig. 2, shows a die in process of making in a vertical die sinking machine, and Figs. 3 and 4 illustrate examples of rough and finished forgings. Fig. 5 and shows a comparatively simple machining operation, while Fig. 6 illustrates an automatic turning operation, on a New Britain automatic, in which fast chucking is made possible by the uniformity of the forgings.

DATA TABLE 2

ALUMINUM ALLOYS COMMONLY USED FOR NON-FERROUS FORGINGS

ALLOY	MECHANICAL PROPERTIES					NOMINAL CHEMICAL COMPOSITION			
	Minimum Specification Values				Density	Per Cent of Alloying Elements; Balance Aluminum			
	Tension			Hardness					
Symbol*	Yield Strength (Set = 0.2%) Lbs./Sq. In.	Ultimate Strength Lbs./Sq. In.	Elongation Per Cent in 2 Inches	Brinell 500 KG Load 10 MM Ball	Lb. Per Cu. In.	Copper	Silicon	Manganese	Magnesium
2 S-H	21,000	24,000	15	44	.098	0	0	0	0
14 S-T	55,000	65,000	10	125	.101	4.4	0.8	0.8	0.4
17 S-T	30,000	55,000	16	100	.101	4.0	0	0.5	0.5
18 S-T	40,000	55,000	10	100	.103	4.0	0	0	0.5
25 S-T	30,000	55,000	16	100	.101	4.5	0.8	0.8	0
32 S-T**	40,000	52,000	5	115	.097	0.9	12.5	0	1.0
A 51-ST**	34,000	44,000	12	90	.097	0	1.0	0	0.6
53 S-T**	30,000	36,000	14	75	.097	0	0.7	0	1.3

* S Signifies wrought alloys.
H Signifies completely cold worked.
T Signifies completely heat treated.

** 32 S-T contains 0.9 nickel and A 51-ST and 53-S-T each contain 0.25 chromium.

By Herman Granberry

Engineering Specifcations

Clearly defined terms and specified procedures for processing result in improved products and greater manufacturing economy.

THE sole purpose of any engineering drawing is to convey information, but in order to be acceptable in modern practice the drawing must also present all information necessary to the manufacture of the part and must present it in the simplest and most convenient form.

There are still in existence many so-called engineers who give such specifications as "Mild Steel" (or "M.S."), "Angle must be held," "six holes equally spaced," "pack harden," "grind to slip fit at assembly," and many other such notes which may be more confusing than enlightening. These same fellows will quickly point out that it is their job to specify what is to be made and the shop can make it any way they please so long as it looks like the drawing when it is done.

It has been said that an engineer is a man who can do for fifty cents what any "darn Fool" can do for a dollar. Whether this statement be correct or not, it is a fact that engineers must be cost conscious and so design the part that it can be made in the most economical manner. Indeed, if an engineer does not know *how* a part may be made, is he sure that it *can* be made at all? It is not sufficient to merely design a part or a tool that will satisfactorily fulfill its purpose: It is necessary that this tool or part be so designed and so drawn that it can be made in the simplest and most economical manner.

In other words, an engineer must design the part so that it will function satisfactorily and so that the part can be manufactured most economically with the facilities available. Sure! It is a man-sized job, but an engineer is a man and not some gremlin whose sole aim in life seems to be that of annoying and confusing the manufacturing departments by drawing up all sorts of difficult and expensive things for them to make.

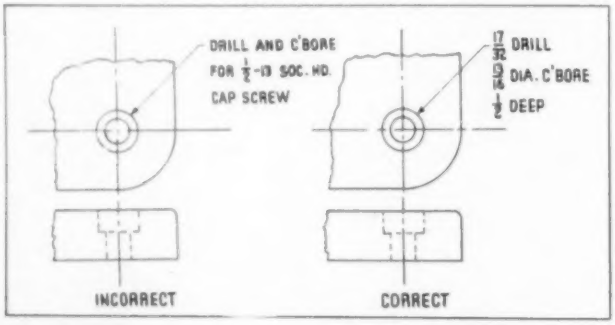
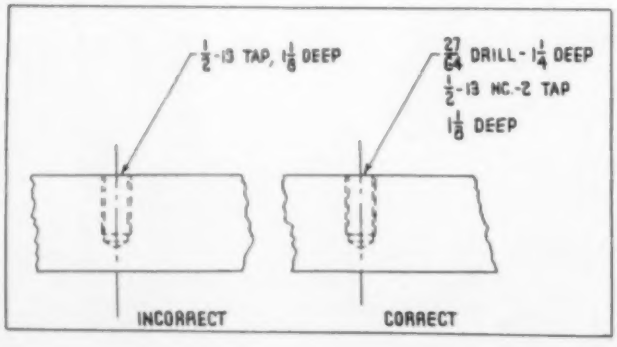


FIG. 1, above.

FIG. 2, below.



1. GENERAL:

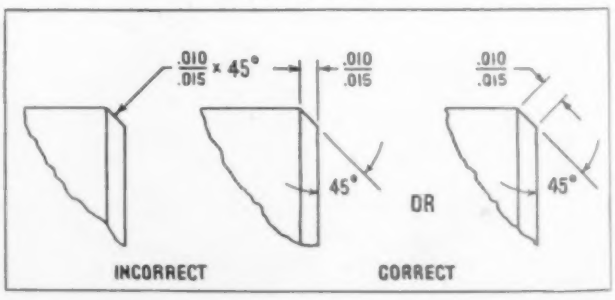
Standard information should be placed in a similar position on all drawings. For example, the scale, part number, material, and heat treatment should be in about the same place on each drawing so that it is not necessary to search for this information. Views and projections should be arranged in a standardized manner and such short cuts as the omission of sectioning lines should be avoided. Some engineers specify co'bores merely by a note to "drill and co' bore for ½ socket head cap screws." This means that the man in the shop is to be the judge as to what diameter clearance hole and co' bore is required. The proper method of specifying such a co' bore might be "7/32 drill, 13/16 co' bore, ½ deep" (See Fig. 1). The latter method of specifying co' bores takes as little or less time than the first method and does not leave it up to the judgment of the man in the shop.

Herman Granberry, Engineering Coordinator with NATCO, is a graduate (B.S. in M.E.) of Texas Tech. He was subsequently employed by S.K.F. Industries and Physicists Research Co. of Ann Arbor, Mich. Joining the National Automatic Tool Company, Richmond, Ind., was successively process engineer, ass't. gen'l. foreman and chief tool designer before being stepped up to present position. He is a member of Tau Beta Pi and of Richmond (Ind.) Chapter, A.S.T.E. of which he is Vice-Chairman.

It is evident that such specifications as "make spring to suit" are not desirable since they leave it entirely up to the man in the shop to design the spring. Specifications for tapped holes are not acceptable unless they indicate the tap-drill size and the class of fit desired (See Fig. 2). Specifications for chamfers should show the method by which the chamfer is to be measured as indicated in Figure 3.

At all times it must be kept in mind that engineering specifications should clearly show: (1) The lowest quality of workmanship and material which is acceptable, and/or (2) the permissible variations acceptable. Many engineers specify close tolerances or high grade finishes when they are not necessary and thus increase the cost of manufacture.

FIG. 3, below.

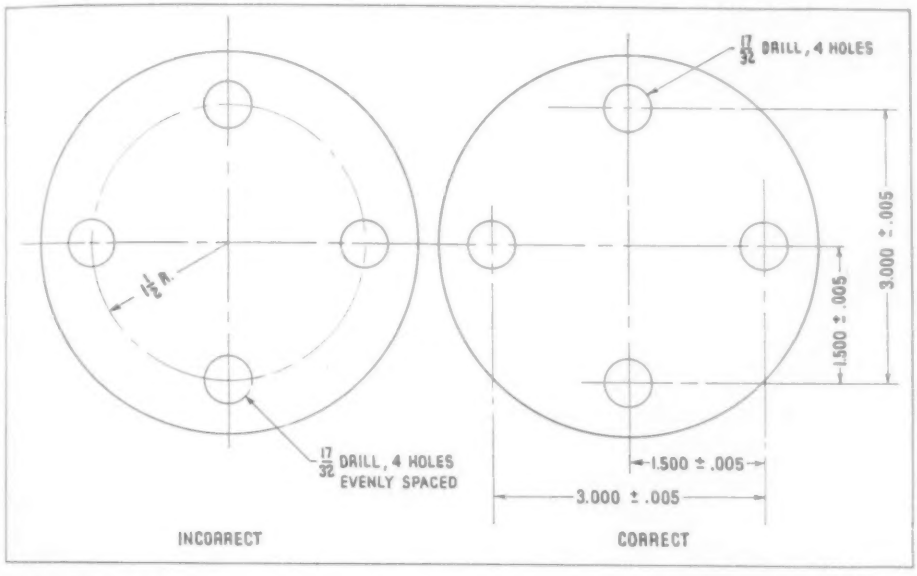


2. DIMENSIONS:

In all cases the drawing should show the dimensions needed in the shop, and give them in the manner which will be most convenient and practicable for the workman.

If a part contains holes that must be bored on a jig borer, they should be dimensioned from data lines by means of straight-line dimensions. These data lines should intersect to the lower right or upper left of the part drawing in order that the operator will not have to add or subtract to obtain the dimensions on his machine (See Fig. 4).

It will usually be found that there are a great number of different ways in which a part may be dimensioned, but only one best way. This best way is the way the man in the shop must use the dimensions on the machines and equipment that he has to work with.

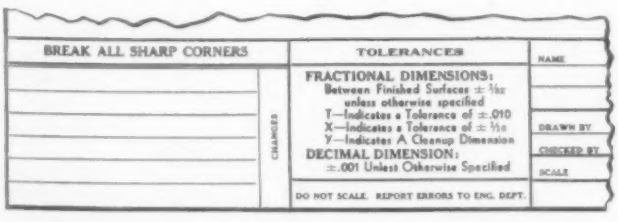


3. TOLERANCES:

A dimension without a tolerance is of little value in describing what is acceptable and what is not acceptable. All dimensions and angles should have their tolerances shown on the drawing beside each dimension, in the title strip (as shown in Fig. 5), or specified by an engineering standard sheet which has been issued to the shop. It is common practice for some engineers to specify that "angle must be held," "this surface must be held parallel to base," or "hold," but this does not say how close they must be held and, therefore, is of little value. Tolerances for small diameters should be given by specifying the maximum and minimum dimensions, while tolerances for larger diameters and location dimensions should be shown as plus or minus beside the basic dimension. For external dimensions the maximum limit is placed above the dimension line and for internal dimensions the minimum limit is placed above the line (See Fig. 6).

Fractional dimensions should have fractional tolerances; decimal dimensions should have decimal tolerances. By consistent adherence to a standard, confusion will be eliminated and workmanship improved.

FIG. 5.



4. FITS:

An engineer sometimes resorts to such specifications as "slip fit," "press fit," "wring fit," "tap fit," or "snug fit" because he does not know what tolerances on the mating parts are required to give him the fit which he wants and so he leaves it up to the operator in the shop to do this part of his engineering for him (See Fig. 6). Of course, there are exceptional cases in which it is not practical to hold the necessary limits on the holes due to the method of manufacture and the male part must be ground to suit the hole (as in the case of grinding the O.D. of drill bushings to press fit into the bushing plate).

5. MATERIALS:

Such material specifications as "mild steel," "welded construction," "cast iron," "cast," "C.R.S.," "M.S.," or "Bar Stock" are not clear and specific as to what material is required.

Each different shop usually has its own understanding as to what materials will be used when certain terms are used on the drawing, but these "understandings" are likely to vary from one person to another, and certainly from one plant to another, and can thus be the cause of serious errors.

When no other standards have been established, however, it is usually best to resort to some well known standard such as the S.A.E. Analyses.

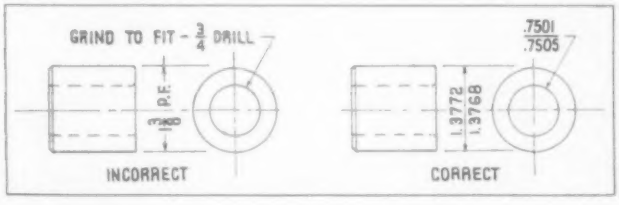
FIG. 4 at right.

6. HEAT TREATMENTS:

Heat treatments should be so specified that there is no doubt as to what is required. Such specifications as "harden," "carburize and harden," or "file hard" are not satisfactory specifications for heat treatments since they do not tell how hard the material should be nor just what method of heat treatment is necessary to obtain that hardness on that particular material. A specification to "pack harden" is not complete unless it also indicates the depth of case and hardness desired.

Most engineers find it more convenient to establish a series of standard heat treatments and specify heat treatments by means of letters or some such symbol on drawings. Of course, these standards must be placed in the hands of the shop in order that they will understand the meaning of "heat treat A" or "heat treat C." An engineering standard practice sheet such as the one shown in Figure 7 is a convenient method of supplying this information to the shop and other departments concerned. Note, here, that a drawing of the part to be heat treated, together with heat treating specifications, obviates any possible excuse for error in processing.

FIG. 6.



NATCO	ENGINEERING STANDARD PRACTICE Standard Heat Treatment SAE 5145	SHEET DATE

MATERIAL		
SAE 5145 (U. M. A. 4)	24	Heat Treatment "R". 1. Normalize at 1575° 2. Cool in Box
SAE 5145 (U. M. A. 4)	25	Heat Treatment "S". Flame Harden Gears 1. Heat to 1500° to 1525°F. 2. Quench in oil to 200° F. 3. Draw at 400° F. for one hour 4. Rockwell 45 to 55 The hard zone will extend into the gear (below root of tooth) a distance equal to ½ the tooth width measured on pitch line.

FIG. 7.

7. MANUFACTURING DATA:

As was pointed out before, it is not sufficient merely to show the finished dimensions of the part with no regard as to the manufacturing methods. It follows, therefore, that it is sometimes necessary to include any unusual or special information in the specifications for the use of the manufacturing division. This information may be in the form of turning dimensions for ground diameters (See Fig. 8), construction pads for use in machining, pattern-making data, dimensions over wires or pins for special or unusual threads or gears, etc.

These requirements emphasize the need for a thorough knowledge of shop equipment and processes by the engineer. In these instances the engineer figures the data required and puts it on the drawing where it is permanently recorded for future use, whereas, if the man in the shop were required to make these calculations, he must do so each time the part is manufactured.

Let us examine the example of turning dimensions for ground diameters. The shop and engineering department can readily work out a few brief rules for use by the designer in determining the proper amount of stock to be left on diameters which are to be ground. These rules will usually be based on diameter and/or length of the part and when once established may be incorporated into the engineering standards book. These values are then used by the designer at the time the part is dimensioned, the methods department can compile standard time values for turning and grinding on the basis of these standards and the lathe operator does not need to guess at the proper amount of stock which must be left for grinding nor add nor subtract from the grind dimension shown on the print in order to determine the diameter and limits for turning. The grinding operator has a standardized amount of stock to remove and all tooling is made up on the basis of these allowances. Of course, it is a cost cutting tool.

8. STANDARDIZATION:

Standardization is the establishing by authority, or general consent, of a rule or model to be followed.

Standardization is one of the most useful devices by which the engineer can reduce the cost of the manufactured part. Standardization of specifications in regard to form, dimensions, tolerances, sizes, and materials enables the shop to manufacture parts in larger quantities, with standardized tooling, and thus at a lower cost.

Standardization must originate in the engineering department, but it cannot be successfully carried out without the complete cooperation of the manufacturing departments.

Some engineering departments in attempting to standardize go to the extreme of drawing up specifications for a multitude of parts which may never be used in order to preclude the possibility of an engineer's needing a part which is not drawn up. This is usually done in order to be sure that any parts used in the future will be according to the new standard, but it is more desirable and practical to establish the standard method by which these parts are to be designed rather than to draw up a great number of so-called standard parts which may never be used.

An illustration of this might be that of establishing a "standard," consisting of all sizes and lengths of cap screws which are listed in the various catalogs, when only a fourth of these sizes would be sufficient. This is certainly not true standardization and it does more to confuse the production department than to simplify and standardize the parts so that larger quantities may be ordered and a stock of the standard items maintained. A standard should limit and confine an engineer's choice, not give him a multitude of standard items to choose from.

The American Standards Association is doing wonderful work in the standardization field and it is usually best to adopt these American standards wherever possible rather than create any new standards.

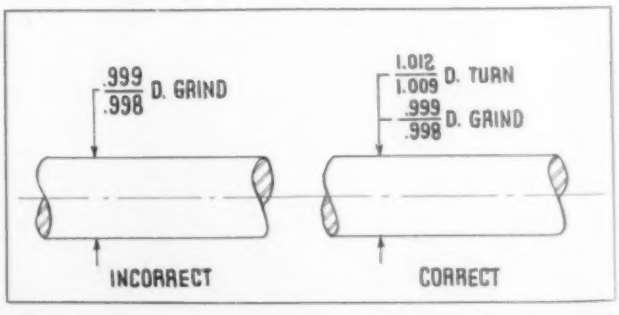
9. SUMMARY:

If we engineers were to examine our work closely we should probably find that each of us is guilty of one or more of the above-described "shortcomings," but we should probably also agree that the job should be done properly as described above. Yes, an engineer has a real job and must possess a lot of "know-how." The engineer alone knows—or at least, he should know exactly what is desired, how it should be made, and what variations are acceptable. He also has all the necessary information at hand from which to determine what will be needed on the print from a manufacturing standpoint, and after this information is placed on the drawing, we have a permanent record which may be used by both operator and inspector as a common yardstick.

Each of the functions described above is an engineering responsibility, but it will be found that as the plant increases in size, the engineer's function will be divided and handled by engineers specializing in such items as sales, electrical, hydraulic, materials, production, methods, etc. However, so long as a plant is interested in cost reduction, no plant is so small but that the above described methods of preparing engineering specifications are worth while.

No doubt one big reason that the old-time toolmaking trade required so much training and experience was the fact that (due to, shall we say, poor or incomplete tool engineer-

FIG. 8, below.



ing it was necessary for the toolmaker to do much of the engineering himself. He usually had to decide what materials, heat treatments, fits, and tolerances were required, in addition to deciding upon the manufacturing procedure and doing a wide variety of skilled work himself.

This is, of course, an expensive method and it is evidently more economical and desirable to let the engineer do the engineering, the lathe operator do the turning, the mill operator do the milling, the toolmaker the toolmaking, and so on. As the works manager of a large lathe manufacturing concern has pointed out, "we find that engineering is most expensive when it is done in the shop."

In closing, let us again point out that it is not always necessary to show all engineering specifications on the drawing itself; it may be more convenient to establish engineering standards for various items and supply all parties concerned with copies of the standards for use in conjunction with, and in addition to, the drawing. Of course these standards must be originated, maintained, and followed by the engineering department. The use of such standards does much to encourage engineering standardization and to simplify tooling and production in the shop.

INDUCTION AND DIELECTRIC HEATING DATA

The following Dielectric Heating Formulas have been compiled by the Industrial Electronics Division, Westinghouse Electric Corporation, Baltimore, Md. Because of their value in the field of Induction heating, they are passed along to our readers, many of whom are facing, or who may meet, problems of utilizing radio frequency heating.

Ed.

1. CAPACITY OF A PARALLEL PLATE CAPACITOR

$$C = .224\ e' \frac{A}{D} \times 10^{-12} \text{ (farads)}.$$

C = capacity (farads).
e' = dielectric constant.
A = electrode area (sq. in.).
D = distance between electrode (inches).

2. POWER INPUT INTO A DIELECTRIC

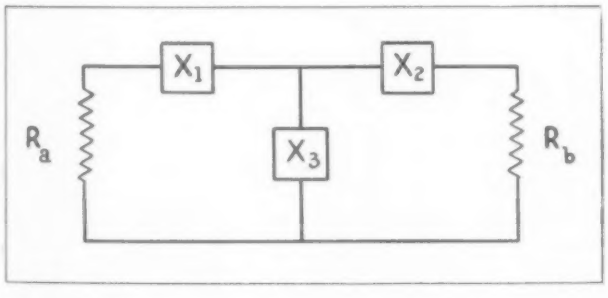
$P_v = 1.41\ f\ E_1^2\ e''$ (watts/cu. in.).
P_v = power density
f = frequency (Mc/sec.).
E_1 = kilovolts/in.
e'' = loss factor.

3. "T" NETWORK EQUATIONS

$$\frac{R_a}{R_b} = \frac{X_1 + X_3}{X_2 + X_3}$$

$$-R_a R_b = X_1 X_2 + X_1 X_3 + X_2 X_3$$

R = resistance (ohms).
X = reactance (ohms).



4. EFFECTIVE SERIES RESISTANCE OF A CAPACITOR

$R = X\ (PF)$ ohms.

$$X = \frac{1}{WC} \text{ ohms}.$$

$W = 2\ nf$.
C = capacity (farads).
PF = power factor.

5. DIELECTRIC LOSS FACTOR

$e'' = (PF) \times e'$.
e'' = loss factor.
PF = power factor.
e' = dielectric constant.

6. WAVE LENGTH ALONG ELECTRODES

$$\lambda = \frac{984}{f\ e'} \text{ (feet)}.$$

λ = wave length (feet).
f = frequency Mc/sec.
e' = dielectric constant.

7. DIELECTRIC HEATING IN AN AIR SPACE

$$E_1 = \frac{E}{t} \frac{10^{-3}}{1 + \frac{G}{t} e'}$$

E_1 = voltage gradient (kv/inch).
t = thickness of work.
G = thickness of air space.
E = total voltage across plates (volts).
e' = dielectric constant.

8. CAPACITY OF PARALLEL PLATE CAPACITOR WITH PARALLEL LAYERS OF DIFFERENT DIELECTRICS

$$C = \frac{.224A \times 10^{-12}}{\left[\frac{a_1}{e'_1} + \frac{a_2}{e'_2} + \ldots + \frac{a_n}{e'_n}\right]}$$

C = capacity (farads).
A = electrode area (sq. in.).
a_1 = thickness of first layer of dielectric (inches).
a_2 = thickness of second layer of dielectric (inches).
a_n = thickness of n^{th} layer of dielectric (inches).
e'_1 = dielectric constant of first dielectric layer.
e'_2 = dielectric constant of second dielectric layer.
e'_n = dielectric constant of n^{th} dielectric layer.

9. VOLTAGE GRADIENT IN ANY DIELECTRIC LAYER IN PARALLEL PLATE CAPACITOR WITH PARALLEL LAYERS OF DIFFERENT DIELECTRICS

$$E_1 = \frac{E \times 10^{-3}}{e'_k \left[\frac{a_1}{e'_1} + \frac{a_2}{e'_2} + \ldots + \frac{a_n}{e'_n}\right]} \text{ Kv/in.}$$

E_1 = voltage gradient (Kv/in.) of layer considered.
E = total electrode voltage (volts).
e'_k = dielectric constant of dielectric layer considered.
a_1 = thickness of first dielectric layer (inches).
a_2 = thickness of second dielectric layer (inches).
a_n = thickness of n^{th} dielectric layer (inches).
e'_1 = dielectric constant of first dielectric layer.
e'_2 = dielectric constant of second dielectric layer.
e'_n = dielectric constant of n^{th} dielectric layer.

Elements of Gearing

No. 2 of a Series

In the previous installment, we outlined the terms used in gear calculation, together with a few simple examples. We will now lay out an involute tooth form and go through the various stages of procedure for making a rotary gear cutter. Here, the first step is to lay out the tooth form.

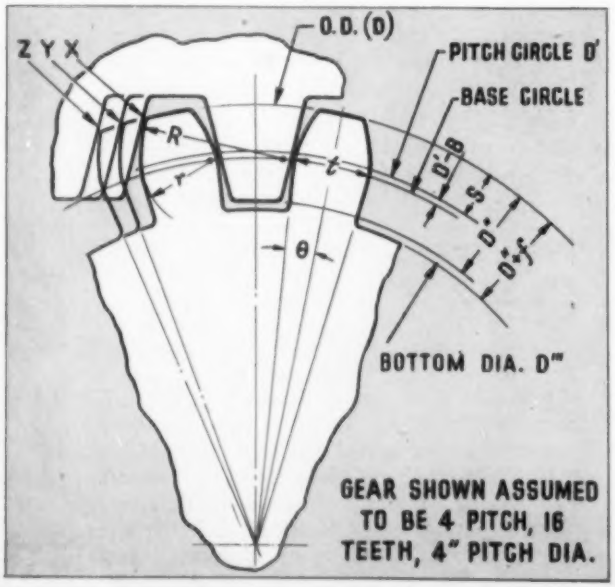
This is usually done by means of a machine which accurately delineates the lines on a steel plate, from which a templet is made. Some years ago, however, George B. Grant devised a method called the Odontograph (tooth writing) which, in combination with tables, enables one to lay out both cycloidal and involute tooth forms with near accuracy. Absolute accuracy is not practically possible.

In using the Odontograph, we draw 4 circles:—the outside diameter (D), the pitch circle (D′), the bottom diameter (D′′′) and a Base Circle. The latter, which is 1/60 of the pitch diameter inside the pitch circle, is used as the locus line for the face and flank radii of the tooth. These radii are constant for pitch, but vary according to the number of teeth in the gear. See Fig. 1 which, for purpose of illustration, may be assumed to be 4 pitch, 16 teeth, 4″ pitch diameter.

Before going into layout and calculation, however, an explanatory note should clarify any possible misunderstanding regarding tooth curves. It is obvious, for example, that if two racks are meshed, they would be locked as far as endwise motion is concerned. It should be equally apparent that a gear having straight flanked teeth—i.e. 14½° per side—could not be rolled although there might be some limited movement.

To provide for roll, then, it is necessary that the tooth flanks be curved. Note, in Fig. 1, the progressive roll of the gear at points XYZ. In this connection, rotary gear cutters were originally made with 8 different forms, as follows:

FIG. 1. Showing procedures for layout of a Tooth. The gear shown is proportioned to 4" pitch dia., 4 pitch, 16 teeth.



No. of Cutter	*Tooth Range*	*No. of Cutter*	*Tooth Range*
1	135 to a rack	5	21 to 25
2	55 to 134	6	17 to 20
3	35 to 54	7	14 to 16
4	26 to 34	8	12 and 13

However, these cutters will be theoretically correct only for the lowest number of teeth. Thus, gears cut with a No. 8 cutter, which has the greatest curve, would be sure to roll freely together, regardless of the number of teeth, whereas a cutter beyond range would result in interference, at the points, as the gears roll. Also, if the radius R is too great, there would not be a continuous motion but, theoretically, a variable motion, due to the recession, during roll, of the face radius. Practically, however, gears so meshed would operate, with the error to be considered only in extreme cases of ultra-precision requirements. To insure greater accuracy, however, cutters were later made in half numbers, as below:

No. of Cutter	*Tooth Range*	*No. of Cutter*	*Tooth Range*
1½	80 to 134	5½	19 and 20
2½	42 to 54	6½	15 and 16
3½	30 to 34	7½	13
4½	23 to 25		

Even this compromise insures only relative accuracy, especially as commercial involute cutters, for gears of 14½° pressure angle, combine with the cycloidal and involute forms. This is to reduce the undercut and its consequent weakening at the root of the tooth. By referring again to Fig. 1, it will be seen that, as the sides of the space are relatively parallel (the tooth flanks radiate from the centerline) the root of the tooth is narrower than the thickness (t) at the pitch line. To insure absolute accuracy of an involute form cutter, then, it would be necessary to make a cutter for the exact number of teeth in a gear. Since such extreme would not be generally practical, a compromise is resorted to as in the cutter ranges shown above.

Now, coming back to tooth layout, the first consideration is the diameter of the gear (on the pitch line), the number of teeth and the pitch. Using the gear shown in Fig. 1 as an example, the pitch diameter is 4″, the number of teeth 16 and the pitch 4 (diametral). We then draw the pitch circle and, adding 2 to the number of teeth, divide this by the pitch—i.e. 16 × 2 = 18:4 = 4.5 O.D. That establishes the addendum as .250, which is also the dedendum, the total .500.

Next, we establish the thickness (t) of the tooth on the pitch line. 4″ × 3.1416 = 12.5664 which, divided by 16, is .7854 for the circular pitch or (half that) .3927″ for "t." 1/10 of "t" (.03927) is the clearance "f" which, added to the depth of the tooth, is .5393 for D″ + f or .2893″ for s+ f. The bottom diameter is therefore 3.4214″. We next draw the base circle, which is 1/60 of the pitch diameter inside the pitch circle, or 60:4 = .0667 or 3.866″ for the base circle.

Next, striking points on the base circle, we draw the face and flank radii—R and r respectively. From 10 teeth to 36 teeth, these radii "close up" in progressive ratio, and beyond that—as from 37 teeth on—they merge into one radius. For example, the constant for 10 teeth is 2.28 for the face radius, and 0.69 for the flank radius, while for 36 teeth these radii are 4.45 and 3.23 respectively for an involute tooth.

However, these constants are for 1 diametral pitch, and, to obtain the proper value, we must divide these constants by the pitch used. Thus, the constants for 16 teeth are 2.92 and 1.46 for the face and flank radii, and these divided by 4 leave us .73 and .365 for R and r in the order shown. We then draw these radii tangent to the outside leg of angle θ, R ending at the O.D. and r merging into R with the straight side of the flank. We repeat on the opposite side of the tooth. Tables for these constants may be had in the handbooks.

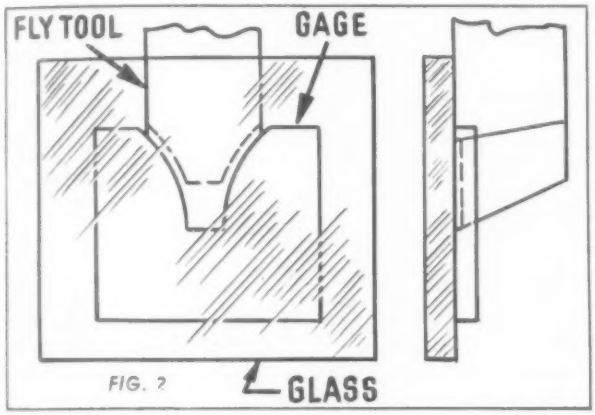


FIG. 2

As an alternate method, for a single curve, draw a base line circle .9682 of the pitch diameter, which, in the case of the 4″ dia. gear, would be 3.373″. Then strike a semi-circle, which is ½ of the pitch radius, from the center to the pitch line. The center line of this semi-circle is tangent to the tooth flank on the pitch line. Then, with the point on the base line, draw a curve bisecting the pitch circle and "t," and repeat on the opposite flank. We then have a single curve tooth.

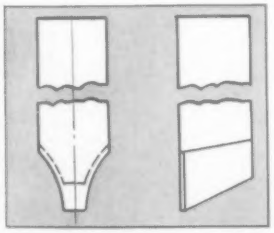
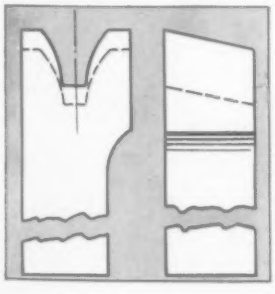


FIG. 3. *ABOVE.* Fly Cutter.

FIG. 4. *BELOW.* Form cutter.



Assuming either method, we now have a tooth form, laid out on sheet steel, from which we make a templet or, more properly, a gage as shown in Fig. 2. This gage must be symmetrical on the center line. From this gage, we scratch off the tooth contour onto a fly cutter (Fig. 3) which is roughed to shape, dressed down to fit the gage, and then hardened. After hardening, it is again fitted to the gage and stoned down, with a piece of plate glass to insure parallelism of face, until light is either excluded or indicates the desired accuracy.

Next, a form tool (Fig. 4) is roughed out, using the fly center as a templet. Preferably, this tool is made of high speed steel. It is mounted at an angle in a vise or special fixture—preferably the latter—at a suitable angle which, for cutting steel, would be about 12°. The fly cutter is then mounted at exactly the same angle, with its face to the back of the form tool.

The form tool is then planed. Here, either of two methods can be used: It can be placed in a milling machine, with the fly cutter held in a fly arbor and the spindle locked, when the operator traverses the table by hand. Since it is absolutely essential that there be no rubbing on the back stroke, the table must be dropped each return stroke and recurrently brought up until the complete form is cut, without any scratches or tears on the form tool.

As an alternate, preferred method, and used in the commercial manufacture of gear tools, the form tool is machined in a special planer which automatically drops and raises the table on the return and working strokes. Feed, however, is by hand, and requires considerable discretion and sensitiveness on the part of the operator. It is not recommended that tools be planed in an ordinary tool room shaper. For one thing, the clapper box would have to be locked, or, the stroke extended so that the operator could raise it by hand before each return stroke. For another, the speed would doubtless be too great, and finally, there would not be sufficient rigidity for a good job.

The form tool planed, it is then hand dressed for smoothness, when it is hardened and, finally, stoned and lapped to a high surface finish as well as nearly absolute symmetry. Note, in Fig. 4, that one side (the left hand) is straight—preferably ground—and parallel with the center line of the form. This is for lining up in the lathe when forming the blank for the rotary cutter, Fig. 5.

The cutter, with the hole slightly undersize to allow for grinding, and with the keyway splined, is first turned to the approximate finished diameter, and then stamped, on one side, for number, pitch, number of teeth and cutting depth, or D″ + f. The opposite side is usually stamped with the maker's name, the material—as high speed steel—and the date of manufacture. It is then hardened, after which the hole is ground to required arbor size and the sides ground parallel and at right angles to the center line of the hole.

FIG. 5

FIG. 6

Finally, the teeth are ground on the face and radially to the center line, when it is ready for work. Quite often, "stocking" or roughing cutters are used in a preliminary operation to finishing; however, a stocking cutter may be mounted side by side with the finishing cutter, so that both roughing and finishing cuts are done simultaneously. A stocking cutter is shown in Fig. 6, and, while great care is taken in its manufacture, it naturally follows that the extreme of precision required for the finishing cutter is not necessary.

Next, in this series, we will discuss the stub tooth and the shaping of gears.

By A. E. Rylander

A Tool of Today Sets Production Pace for Tomorrow

Man-Au-Trol, the electrical brain, converts standard Bullard machine tools to automatics and boosts production and repetition accuracy far beyond previous attainments.

WHEN a preview of a new development, by a leading builder of machine tools, brings together four score and more representatives of domestic and foreign trade publications, one may reasonably expect the unusual. It portends News in Industry.

Such was the case at the recent press review of Man-Au-Trol, at the plant of the Bullard Company, Bridgeport, Conn., when an audience that included top flight editors of the leading technical magazines sat in rapt silence as the latest addition to the Bullard line was put through its paces. Staged in a "theatre," with highly dramatic effect, the machine rather than the man played the stellar role.

"I am Man-Au-Trol, master of the machine. My family has a world-wide reputation for service in industry, and an established record of accomplishment. I came into being just prior to the war but was held under government secrecy orders although . . . . permitted to serve my apprenticeship on war work for my family. I can work twenty-four hours a day, including Sundays . . . . without fatigue.

"Control with meticulous accuracy is my strong forte. . . . Founded on established engineering principles, there is no magic or mystery in me. While not an engineer, I can implement an engineered time study with the utmost exactitude. . . I am the machine operator's dream for I relieve him of all physical effort and responsibility. His sole duty is to supply me with work. I give him opportunity for wider service on a higher plane. To the handicapped ex-service man, unable to perform manual operations, I offer opportunity to re-establish himself on a part with those not so handicapped.

"I am also the servant of the master who owns me. For him, I reduce costs substantially, insure exact duplication of sizes and close adherence to production plans. Because I am both manual and automatic, I provide opportunity to be kept continuously at work. I am a basically new type of automatic control, suited to any field where a series of operations can be predetermined and where repetition and duplication is required.

"I am as flexible as man, yet can control any series of operations faster and more precisely than any man. I am a new tool in industry and open up vast new fields for development. Having shown that I can speak for myself, I will ask my operator to assist . . . in showing how I take the drudgery out of his work. He will point out my controls."

At this point, the operator stepped from the "wings" and manipulated the various valves and controls that determine whether the machine is to be manual or automatic in operation. Then, at the ostensible command of the machine, he pressed the starting buttons for the hydraulic system and automatic cycle. With the operator back in the wings, the machine then ran through the various cycles required to rough and finish machine a steel wheel, when the "monologue" continued:

"Functions of speed, feed rate and directions are selected simultaneously and much faster than man can think and act. To coordinate the functions of the machine which I control, I must act fast. My brain is electrical—my strength mechanical—my life-blood hydraulic. Note that I use the same tools for rough and finish cuts, therefore, *use fewer tools than previous automatic machines.*

". . . . There is no chance for human or cumulative error as I operate on a predetermined plan and detect . . . head locations with extreme accuracy . . . consistently repeated

FIG. 1. 36" Man-Au-Trol Vertical Turret Lathe. Man-Au-Trol unit shown at upper right. Feed works immediately below.

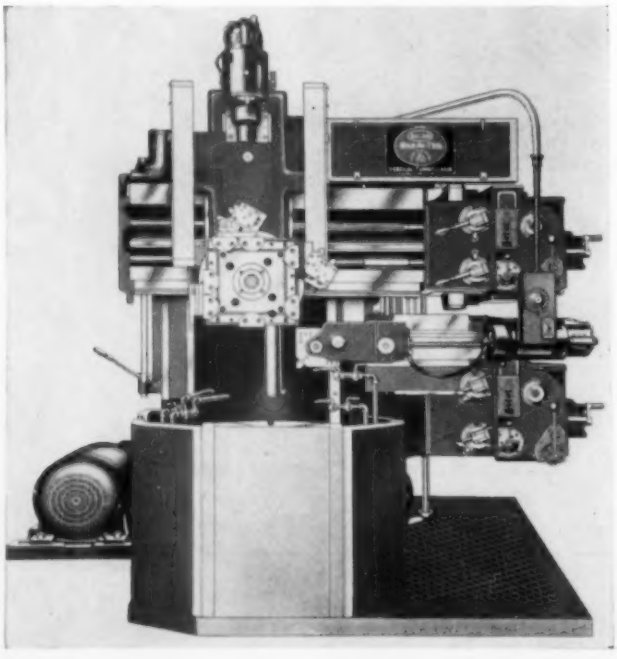
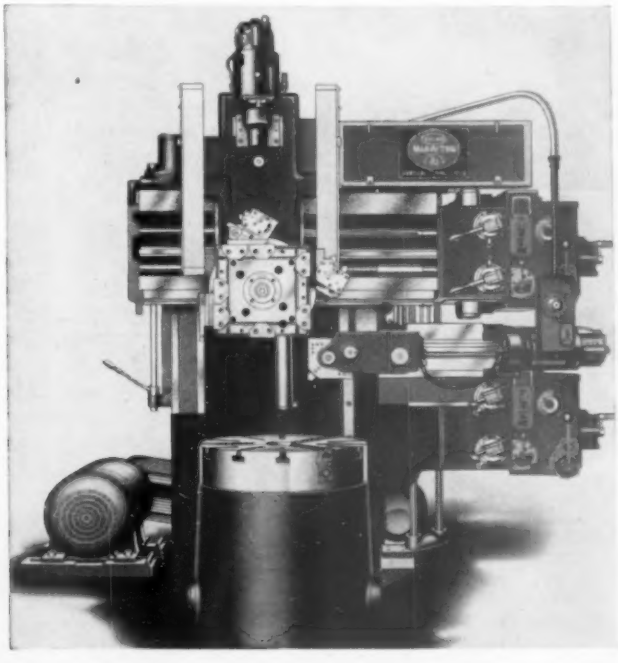


FIG. 2. 30" Man-Au-Trol Vertical Turret Lathe. Man-Au-Trol unit shown at upper right. Feed works immediately below.



within tenths for each and every piece . . . because design makes accuracy independent of machine wear and tool load. I only direct and control functions . . . am idle when the machine is cutting. The time of the work you have seen machined would have been 20 minutes on a manual Vertical Turret Lathe, but you have seen it done in 5 minutes and 45 seconds.

"What you have seen . . . is only one of many applications. Length of cut, time, repeat of the same cut, instantly or later, are no obstacles. My functions are not limited by time switches or cams—only by the capacities of the machines to which I am applied. To further prove my field of operation, I would . . . introduce . . . my new brother—the Bullard Man-Au-Trol Horizontal Lathe—who will speak for himself."

(Change of voice): "You have heard from my experienced brother—Man-Au-Trol Vertical Turret Lathe—and since I spring from . . . experienced people in progressive engineering, I offer in the horizontal field of work new economical productive methods for horizontal chucking and work between centers. My principles of control are identical to those of my brother . . . therefore, I need not have my operator perform manually . . . I shall . . . demonstrate that time and length of cut are not stumbling blocks. Operator, give me life!—put me through automatic cycle."

A pause, during which two steel shafts were machined simultaneously. Then: To machine this piece . . . previously required 18 minutes. You have seen me do it in 3 minutes and 20 seconds—but, two pieces have been machined, making 1 minute and 40 seconds per piece."

The "monologues" by the machines have been reprinted here, in gist, partly to take the reader to the scene of demonstration, but mainly because they outline, in simple language and terse sentences, the functions of Man-Au-Trol and its application to two standard Bullard machines—the Vertical Turret Lathe and the Horizontal Lathe. As implied, however, these functions can be applied to other machine tools—provided, that is, that designs are coordinated.

Taken as a whole, the demonstration was dramatic and impressive—so impressive that when E. P. Bullard III, who conceived and developed Man-Au-Trol, said that it was all very simple, his remark exoked a ripple of skeptical laughter. Yet, while it may have seemed complex and involved to the lay spectator, the fact is that it is simple—simple and logical. And therein lies its appeal to hard headed tool engineers and production executives on whom will fall the responsibility of holding down unit costs, in production, in the face of rising wage scales.

As the reader will infer from the "monologues," Man-Au-Trol is exactly what the name implies—an *electrical brain* whose function is to control operating cycles. It is not implied here, however, that the idea of a controlling "brain" is exclusive with Bullard. Various "mechanical brain" controlled machines, some of them very ingenious and the most highly productive, have been developed both before and during the war. The "million dollar machine" long since ceased to be one of the seven wonders of the industrial world.

These machines, however, have been "specials"—i.e., single purpose units suited mainly to long production runs and obsoleted by any major change in design of workpiece or assembly. On the other hand, the Bullard Man-Au-Trol is an *engineered* unit perfectly coordinated with and broadly

FIG. 3. Right angle view, Man-Au-Trol Unit and Feed Works. Main Head.

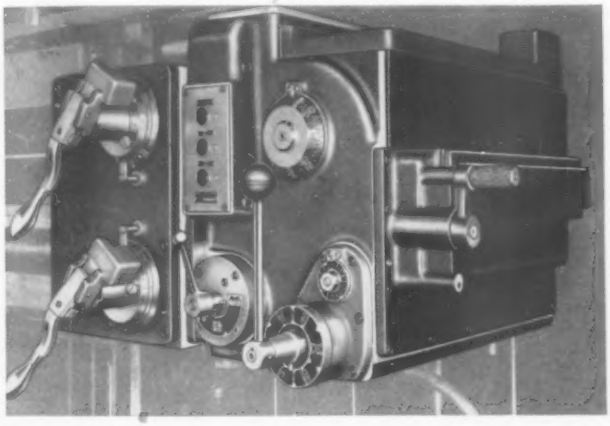


FIG. 4. Front view of Man-Au-Trol Unit showing Controls and open end of Feed Works.

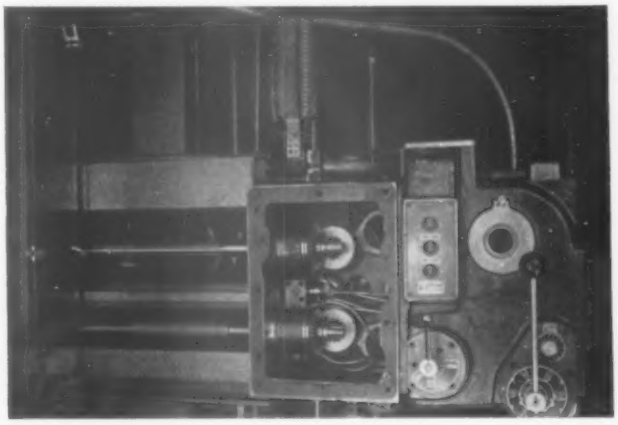


FIG. 5. Top view Man-Au-Trol Unit showing Feed Works gearing.

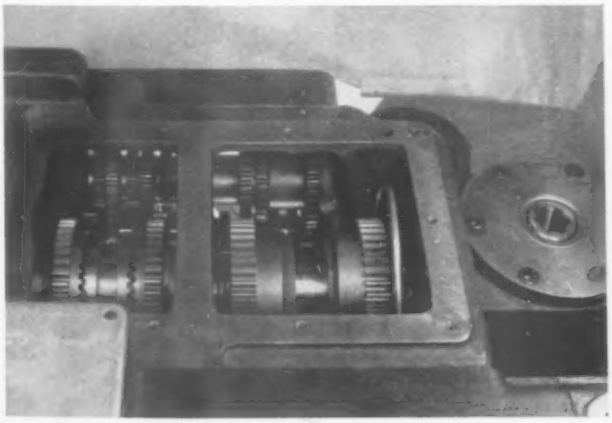


FIG. 6. Rear end Man-Au-Trol Unit showing wiring in Junction Box.

applicable to any machine tool that can be adapted to automatic cycle—as, for example, the Bullard Cut Master Vertical Turret Lathe and the Horizontal Lathe demonstrated at the preview.

With Man-Au-Trol, any and every job involving 39 functions or less can be done automatically, without human or cumulative error and to a degree of repetitive accuracy far beyond the ability of man. A job can be done several fold faster than with manually operated machines, with set-up time from one class of work to another but slightly if any more than with the manually operated. There is the added advantage that it is instantly convertible from automatic to manual operation, with return to automatic without in any way affecting the tooling sequence.

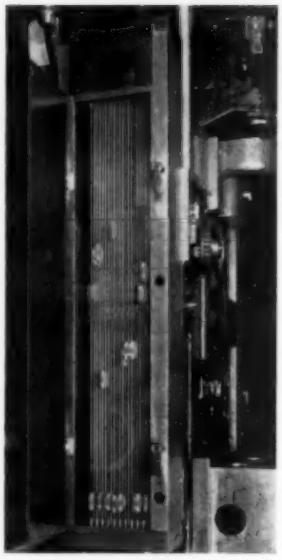


FIG. 7. Left-angle Man-Au-Trol Vertical Head showing banjo wires and stops.

In the strict sense, Man-Au-Trol is not an actuating mechanism. Its function is purely to control. Neither is the machine hydraulically operated. Rather, cams on a rotating drum depress valves which, in turn, activate hydraulic cylinders that engage the various clutches and gears of the machine. To all practical purposes, the operation of the machine is entirely mechanical.

One thing in conclusion. While the introduction may imply a new development, its newness is only relative. Actually, Man-Au-Trol was completed and put to use on a test machine prior to the war. While war secrecy orders barred its publicizing, the machine was tooled for an essential war job and was operated continuously for the duration. This continuous operation proved its soundness, and it is authoritatively reported that the machine produced day in and out on a 24 hour production basis *with not one single piece spoiled!* Truly a record!

FIG. 8. Below. Right-angle view looking into Drum Section—Man-Au-Trol Unit with Drum.

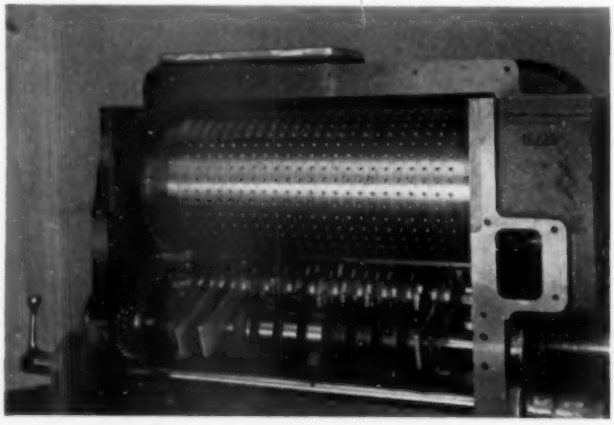
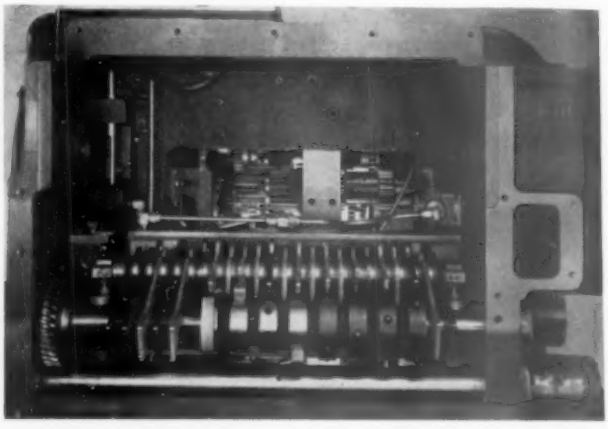


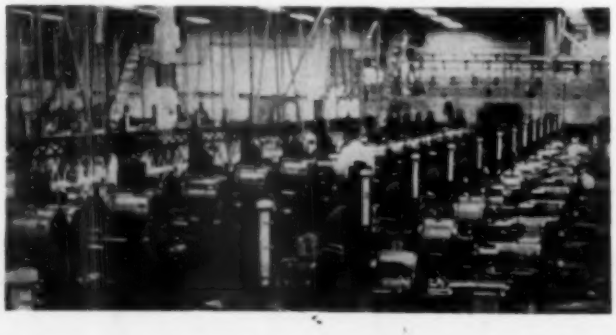
FIG. 9. Full view looking into Man-Au-Trol Drum Section—without drum.



Mass Production and High Precision

When, during the war, an eastern plant was required to manufacture fuel injection devices, for direct injection of high octane gasoline in the engine of certain aircraft, two requirements had to be met:—production in mass quantity and dimensional control within .000005". This close dimensional control was made possible by use of Sheffield high-amplification Precisionaires, and wartime experience now tends to assure that such extreme precision is entirely practical for postwar requirements. In other words, accuracy to millionths of an inch in grinding, lapping, super-finishing, inspection and assembly can now be applied to the mass production of consumer goods.

While the gages described—and shown in the smaller photo—are by now quite familiar to our readers, the installation at each of the many grinders shown may be somewhat unusual. However, with each operator having control of dimensional quality with resultant reduction in rejects, there are effected economies which, in the case of ultra-precision manufacture net worthwhile returns on investment.



Battery installation of Sheffield Precisionaires in a grinding department. Mounted on the machine heads, the instruments are readily seen by the operators for quick, accurate readings.

Close-up, the Precisionaire, in use for hole measurement in the identification room. Each bore is inspected for size and is classified and marked with proper designation.

By Edwin H. Halvorsen

Chromiun-Plating of Cutting Tools

The methods outlined increase tool life and provide for closer control of surface and dimensional quality.

IN HIS article "Perishable Tools on the Firing Line" (May issue, *The Tool Engineer*) Mr. W. A. Johnson set forth the treatment of cutting tools by chromium plating, stating that chromium-plating cannot be added in excess of 0.000018" without peeling. However, a newly developed and listed process of heat treating an electrodeposited thickness of chromium on all types of cutting tools has proven very satisfactory. To date, there has been no report of tools or gages, so processed, having chipped or peeled, or of indicating any brittleness.

Mr. Johnson further questioned the possibility of producing a consistent and evenly deposited plate. By this new process, however, it is not only possible, but has been done. One can now deposit, exactly, any thickness or thinness of chromium plating desired. For example, a research laboratory asked, recently, to have a chromium plate deposited upon a circular plate 6 inches in diameter. The surface of the plate checked within three wave lengths. A chromium plate was deposited, and the final check showed the flat surface to be flat within *one wave length.*

Of course, there may not be so many companies who are interested in measurements in wave lengths, or accuracies to within a microinch, but to those that are, these extreme accuracies are attainable. Practically any requirement can be met.

Edwin H. Halvorsen **is a graduate Harvard University. After some 18 years in diversified engineering, he engaged in industrial consulting, with offices of 35-21 72nd St., Jackson Heights, N.Y. In addition to research and development, he specialized in chromium plating of cutting tools.**

When chromium is electrodeposited upon any material which is subjected to shock or high pressures, the caged hydrogen within the plate is expanded by any heat generated and seeks to escape. The only way it can do this, is to break the plate away from the underlying material (termed spalling, chipping or peeling); also, the remaining hydrogen in the deposited plate causes that plate to have what is called "hydrogen-embrittlement." Up to this point, therefore, chromium-plating on any material subjected to shock or high pressures has not been recommended.

But now, a new method of heat treating an electrodeposited plate of chromium (any thickness from 0.000006" to 0.00003") has caused the hydrogen to "ooze" out making the plate an integral part of the underlying material.

The process itself, is not critical at all and quite simple to operate, and its cost is very reasonable. Mr. Johnson states, however, that some tools of irregular shape may not be as simple to plate as some which have regular surfaces. With this, the writer concurs but, these problems are not so difficult that the average engineer cannot overcome them in a very short time. This fact is fully substantiated by the reports sent in by manufacturers who are using the process in their own plants. As an example, a few are quoted here. The names of the companies are omitted, but if anyone wishes, the names may be had on request.

Company No. 1: (a) Using 7/16"-20 pitch tap, before chromium-plating, 320 holes; after, 3600 holes; (b) Reamers for trunion bearing on gun cradle must stay to size. Before chromium-plating, size reduced in five days. After chromium-plating, reamers stayed on size *six weeks, day and night.* Drill speeds and feed doubled on armor plate and armor plate castings.

Company No. 2:- To decrease wear on shaft at packing gland, we substituted plated Tobin bronze for K-Monel pump shaft,—200 per cent increase in shaft life.

Company No. 3:- Fellows gear cutter, working NE-8447, 5,056 teeth against previous 1,760 but metal removed per grind was only 0.0095 against 0.095", giving 532.22 teeth per 0.001" grind against 18.53. (2,770% increase in tool life).

Company No. 4:- 35/64" drill, working Anaconda Alloy No. 979, obtained 1,100 holes against previous high of 200. (450% increase in tool life).

Company No. 5:- X-company reports in connection with regular production work—not on isolated test: "We increased time between grinds of turret lathe form tools 500% and of milling cutters 1,000%. The turret lathe formerly had to be shut down 30 minutes every 3 hours for tool grinding (and set up). *Down time has been reduced from 15% to 3% and production has increased 14%.*"

In addition to the above tests, by the manufacturers themselves, the writer submits a chart (below) of cutting tool applications and results of comparative performance tests taken from all reports received.

Type of Tool	*Maximum % Increase in Tool Life*
Reamers	2,000%
Drills	1,300
Tool Bits	1,200
Forming Tools	900
Taps	3,000
Counter Bores	600
Milling Cutters	600
End Mills	550
Files	100
Hobs	960
Dies, Punches	1,100
Fellows Gear Cutters	300
Spot Facers	400
Broaches	400
Thread Chasers	750

*** The author declares himself at the disposal of any reader who may wish further information on the method discussed.**

REDUCES FRICTION: One of the important characteristics of chromium plated surfaces is their low coefficient of friction. They are characterized as, "slippery, greasy and nonwetting." That is probably the reason why cutting tools so treated can make heavier cuts. One example is in making threads on armor steel bolts. Whereas plain Stellite cutters broke, treated cutters (chromium-plated and heat treated) were able to make the *full depth thread in one turning,* due to reduced friction.

CONTROLS DIMENSIONS-GAGES: A shell producer (before V-J Day), after using chromium-plating and heat treating process in his own plant for five weeks reports: "We have been able to build up worn gages to exact sizes so they are as good as new. Since many of our gages are not only expensive but difficult to get, this one use of the plating system has and will continue to effect a tremendous saving in both time and money."

It seems hard to believe that manufacturers do not give more serious thought to the chromium-plating and heat treating of all their perishable tools, which will afford them tremendous savings in their tool costs, increased production up to 47 per cent.

Let us look at an outline of the benefits afforded any manufacturer processing his tools by chromium-plating:

(1) Cuts tool consumption; (2) Reduce tolerances; (3) Rejects reduced; (4) Increase Machine Speeds; (5) Cuts "Down" time—(shut down and set up time); (6) Corrosion Deterrent; (7) Controls dimensions—Gages; (8) Friction reduction; (9) Cuts wear (cams, gears, pistons, rings, gun barrels); (10) Material substitution.

The above ten points are not theoretical, but have been made on the basis of actual reports by the users of this process (none of whom are commercial platers).

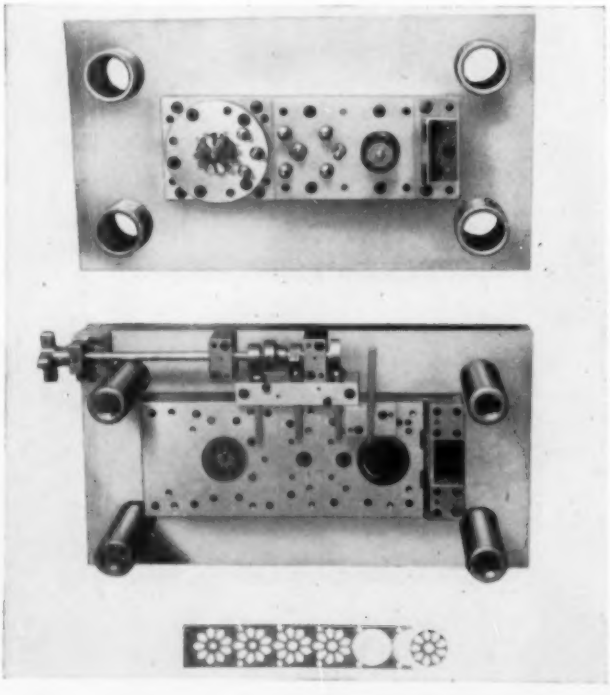
It may be well to add that it is not necessary to sharpen chromium processed tools. After a chromium plated tool has outlasted an untreated (not chromium plated) tool three or four times, the chromium plate is stripped and replated, thus the tool is again ready for further use. It is, of course, assumed that the tool has not been used to such an extent that the material under the plate has been scored.

If a tool has been worn undersize, the engineer has a choice of either having the plater process the tool to exact size by chromium plating, or, of plating the tool slightly in excess of the desired dimension and then grind it to correct size. The latter method is dependent upon the grinding facilities available in the plant. Many undersize plug gages, worn to the point of discard, are easily plated to exact size (plus or minus zero) when they are ready for continued use. It is entirely reasonable to believe that the progressive engineer would rather process his new gages than to allow them to be worn to discard. One manufacturer in particular sent in four new identical gages, of which he uses one for a limited time (three times normal) and then sends it to be stripped and returned. This gage is put on the shelf—each one handled in the same manner—so that one is always being plated or scheduled for plating. In this "round robin" manner of caring for his expensive gages he never has to buy new ones—that is the gages will last him as long as he has a use for them and takes the time to have them periodically processed.

In chrome plating entirely outside of the tool field, experiments are being carried out on aircraft engines. Whereas the normal run of such an engine, before major overhaul, is approximately 600 hours, chromium plating and heat treating of pistons, cylinders, valves, seats and other moving parts will increase its initial life, before major overhaul, to around 6,000 hours (plus)—proof that thin chrome plating "sticks."

CARBIDE LAMINATION DIES

CARBIDE DIES, designed and manufactured by the *New England Carbide Tool Company,* 60 Brooklyn St., Cambridge, Mass., has shown remarkable production records on progressive dies for stamping rotor laminations for small electric motors. This is said to be the first time that carbide has superseded high speed steel for dies of this class.



The silicon steel stock is approximately .014″ thick and 1⅝″ wide. The various steps in the operation consist of punching 9 teeth, 4 pilot holes, a combination shaft and keyseat opening, and cutting off. Solid carbide is used for all the operations, including cutting off, and all pilot pins are made of solid carbide for sustaining accuracy.

Previous to the manufacture of this die, high-speed steel dies had given production of 35,000 laminations between sharpenings. The carbide die has already produced 500,000 laminations, and has not yet been sharpened; therefore, the life of the carbide die between sharpenings has not yet been established. Already, without resharpening, the carbide die has shown an increase of 14 to 1 over the high-speed steel die, which means that, to produce 500,000 parts, the press must be down at least 14 times for resharpening.

Although the original cost of the carbide die is approximately four or five times that of the high-speed steel die, it portends marked economies through the tremendously increased production of parts between sharpenings. It has practically eliminated down time on the press, thus far, and has eliminated the need for stand-by dies which formerly were kept in readiness for insertion on the press while a worn die was being sharpened.

Reported tests on the motors indicated that this carbide die produces better laminations. They are flat, without burrs, are lower in cost, and the final motor is superior.

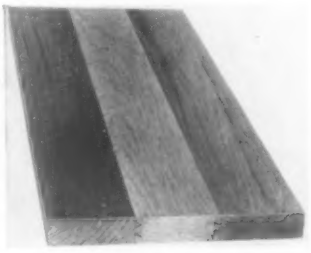
By Gunnar Skog

Automatic Lumber Fabricating Process

New process cancels dimensional limitations and eliminates waste in lumber fabrication.

AN AUTOMATIC process which cancels out the normal dimensional limitations of lumber in the pre-fabrication of almost everything made of wood—from ironing boards to houses—is made possible by an evolution of the well known "Linderman" machine, used for over a quarter century to eliminate waste in the lumber industry.

The process, then, employs no unknown principles. Rather, it is through a combination of various known principles, applied to automatic mass-prefabrication, that the process opens up new possibilities for the economical mass-production of all kinds of articles from wood. With the process, panels ranging from ½ to 3 inches thick, from 10 inches to 16 feet in length, and of practically any width desired can be made "in one piece," automatically, on a single machine requiring only three men—two to feed untrimmed lumber of any size into the two ends of the machine, and one to remove the jointed assembly from the center.



Double tapered dovetails and automatic glueing makes "welded" bond stronger than solid.

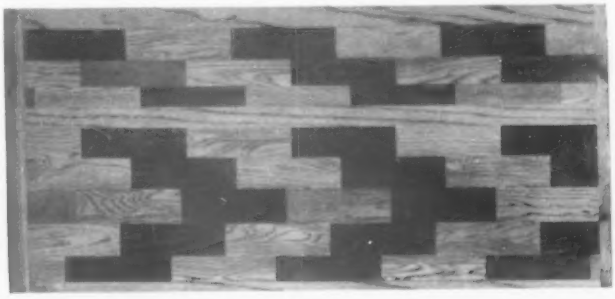
Prime characteristics of this machine, which is manufactured by the Muskegon Machine Co., Inc., Newburgh, N.Y., is that it "welds" together in such a manner that a wider piece made from two narrow pieces is at least as strong—and frequently stronger—than would be a single piece of the same width. This is accomplished by use of a double-tapered dovetail joint supplemented by an automatic gluing process. This locks the wood sections together so solidly that, normally, glue would not be required in many cases. The use of glue, which is forced into the cells of the wood at the joint, is to "fuse" the wood together to form a "welded" bond even stronger than solid wood.

However, it is not our purpose, here, to go into details or specifications of the machine. These may be had from the manufacturer, whose address is given above. But, the process opens a broad vista, not only in fabrication of consumer goods by mass production methods, but in the conservation of a dwindling raw material.

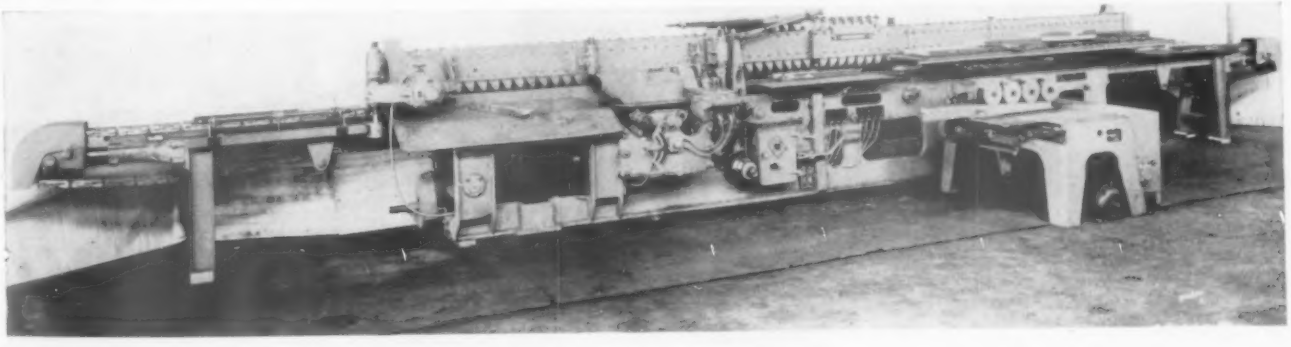
In using the new Linderman automatic fabricating process to produce solid panels for such items as bookcases, ironing boards, table and desk tops, doors of all types, house construction accessories, caskets and boxes of all kinds, square edged lumber or even lumber with the bark still on the edges—may be employed. In connection with the latter a special bark edging attachment is made part of the machine to edge the stock automatically prior to the jointing operation.

In operation, two pieces of lumber are fed in from opposite ends of the machine. When using sound square lumber which might be irregular on the edges up to one-half inch in depth of curve or irregularity, "Selectrion" fingers will preset the feed mechanism so that the cutters remove just the right amount of stock and no more. When straight edged lumber is used, and especially in short lengths, an adjustable feeding fence is used. As the lumber moves into the machine, cutters trim the board and cut tapered dovetail tongues and grooves in the edges. Boards moving in from one end are tongued, those from the other end grooved. As the boards approach the center of the machine, the grooves and tongues are automatically covered with glue, using conical rollers

Lumber with the bark still on the edges is as easily processed as are square edged boards.



"Parquet" flooring and inlays rapidly pre-fabricated on Linderman Automatic Lumber Fabricating Machine, shown below.



(excess glue is removed with stationary "wipers" and returned to the reservoir). As the boards near the center of the machine, the tongue slides into the groove. At first—due to the double taper of the dovetail—the fit is quite loose. As the movement continues, the fit becomes tighter and tighter, until the two boards are locked solidly together.

If the finished panel is to be wider, the jointed boards are returned to one end of the machine, where they are again fed in to meet a single board coming from the opposite end. The panel then is three boards wide. This is repeated until the desired width is obtained. Finally, the assembled panel is passed on to the Linderman chain feed sizing saw and ripped to the desired width. The edging is passed back for use in the next panel, making the operation continuous.

Of particular interest, the process is not limited to fabricating panels by edge assembling. Lumber may also be assembled by running the stock on edge on to a flat piece (for making molding stock); likewise, lumber may be run across the grain for various uses such as flooring and cutting blocks. It is also entirely feasible to produce panels, say, 10 feet long from short lengths, by assembling the pieces endways as well as sideways. It is not necessary to dovetail the ends of such boards together to obtain strength. As to inherent strength of the process, U. S. Army specifications recognize a section made up of the Linderman method as identical with a solid piece of the same size.

By Vaners Borg

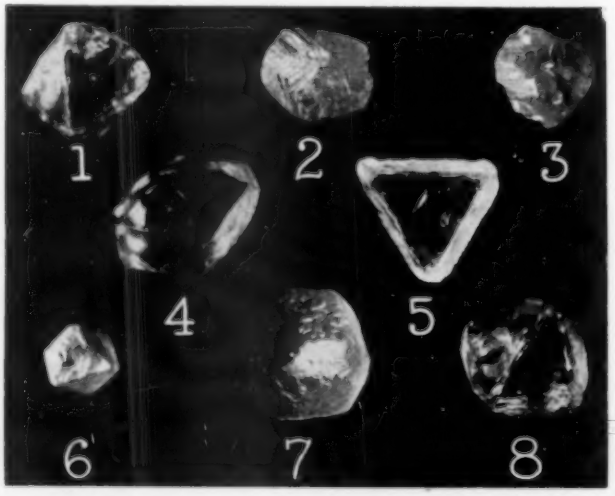
Grade Industrial Diamonds for Specific Uses

USE OF the entire mine output of industrial diamonds is now possible with a method of grading developed by Dr. Harry Whittaker, diamond expert and crystallographer and head of the Koebel Diamond Tool Company, Detroit, research department. According to Charles J. Koebel, president of the Detroit tool firm, the new method not only extends the use of stones previously considered inferior or worthless, but in addition conserves larger, scarcer stones for specific purposes. Dr. Whittaker developed the method in research conducted for the National Academy of Science in a program launched to alleviate the critical shortage of industrial diamonds in early phases of war production.

Dr. Whittaker

Nationally recognized diamond expert, Whittaker first classifies industrial diamonds according to their crystal structure, then selects stones best adapted for specific uses. In research covering thousands of carats, he found that many lower quality stones are as resistant to abrasion as those of higher quality for certain purposes—that is, if they are set correctly and used the right way.

FIG. 1. "Mine run" of industrial diamonds. Sizes can be judged by the numbers which are standard typewriter size. Shown are: (1) rounded octahedron; (2) striated octahedron; (3) mosaic octahedron with poorly formed, brittle structure; (4) dodecahedron; (5) spinel twin, or "macle," ordinarily a strong structure (note clear reproduction of cleavage lines); (6) coated octahedron; (7) common coated round and (8) octahedron. Photo unretouched.



Under the Whittaker method, stones are examined to determine the "hard" direction by their crystal structure, then diamond tools are marked so the operator will use them in the right direction of maximum efficiency. As a result, the useful life of stones previously considered inferior has been lengthened as much as three times. Wide use of smaller stones, and increased wear in operation, not only has relieved a critical diamond shortage that threatened war production, but has released larger and scarcer stones for specific uses such as due for drawing wire used in delicate electronic instruments.

Formerly head of the Crane Company's ceramic research

FIG. 2. Left. Dodecahedron as it comes from the mine. This stone is No. 4 in the group illustration, and this type is particularly adapted for cutting tools.

FIG. 3. Right. Diagrammatic illustration represents the dodecahedron, with the arrows indicating the hard direction.

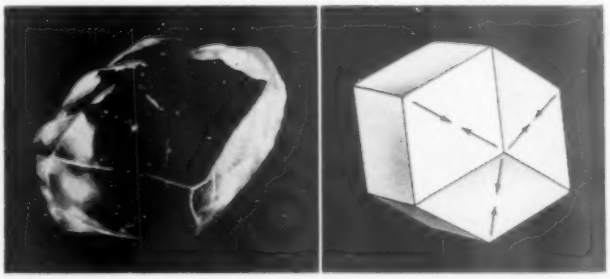
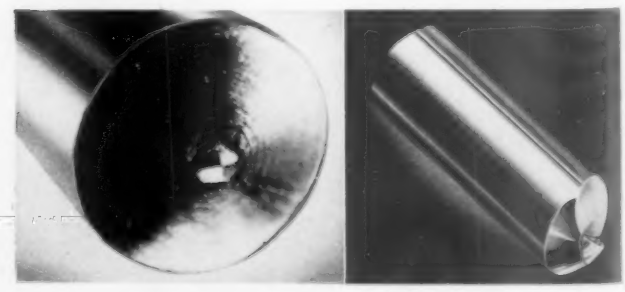


FIG. 4. Left, below. This tool has an octahedron set in a powdered metal mounting, a process originally developed by Koebel research laboratories and now in general use in the diamond tool industry. Scientific grading to determine direction of hardness makes more lower grade stone available for tools like this.

FIG. 5. Boring tool, set in powdered metal mounting, requires a diamond that can be shaped correctly. Shaping the stone and placing it correctly requires expert knowledge of the crystal structure so it will cut in the hard direction, or "against the grain."



department. Dr. Whittaker was loaned to the Academy of Science, where he headed research on industrial diamonds and also served as consultant to the War Production Board on measures to relieve the critical diamond shortage that threatened production in the early days of rearmament. In 1944, he spent several months in Great Britain where he studied the diamond die industry. Before going with Crane he was instructor of crystallography at the Massachusetts Institute of Technology.

His work is declared to have been of incalculable importance, not only to the diamond tool industry, but to manufacturers as well. It is a tribute to American scientific advancement that the almost casual method of diamond classification in the past has been replaced with scientific means of using the right stone for the right purpose. From the social standpoint grading diamonds for industrial use is more important than grading them for gems, and present methods of analyzing industrial diamonds are not far apart from the exacting standards over centuries by dealers in fine gems for ornament.

Analysis of stones by the Whittaker method requires thorough understanding of the structure and specific abilities of each grade of diamond—first, to grade stones for specific uses, and second, to make diamond tools for use to assure best results. The possibilities of using scientific methods of classifying and selecting diamonds for industrial use was early foreseen by Dr. Whittaker, who will continue research toward the end of using stones more efficiently and conserving the still critical diamond supply.

Authorities in the diamond tool industry have placed his research the next important step after development of the powdered metal mounting method for diamonds, which was developed in the Koebel research laboratories and which makes possible the use of smaller, more plentiful stones in diamond tools for grinder wheel dressing, diamond boring and turning tools and diamond core bits.

PRECIPITRONS ELIMINATE DUST

With the growing demand for ultra-precision, and the tendency of dust—especially when laden with fine abrasive particles—to injure delicate surfaces and instruments, engineering and other research laboratories incline sharply toward dust free working conditions. A dust free atmosphere, ideal for testing delicate equipment, is now assured by such devices as the Westinghouse Precipitron electrostatic air cleaner installed in the main air duct of an air conditioning system.

A typical installation is shown in the photographs, below, in the Engineering Research Laboratory of the Landis Tool Company, Waynesboro, Pa. Here, the testing of relays, contractors, motors and electronic devices is continuously carried on under ideal conditions. The return air grill can be seen in the far corner while one of the two ceiling ducts is visible directly above. Of particular interest is the white walls and ceiling. Since, while the system has been in operation over a year, there is no evidence of discoloration due to air borne dust.

Fig. 2 shows the ionizer assembly of the Precipitron. This electric air cleaner is installed in the main air duct of the air conditioning system. When in operation, 9000 cfm of raw air enter the cleaner from this side. While passing through the electrostatic field of the ionizer, each air borne dust particle is given a positive change.

As the air passes through the collector cell, which is located immediately back of the ionizer, the positively charged dust particles are attracted to and deposited on negatively charged plates, thereby removing 90 percent of the dust particles from the air. (Fig. 3) air is distributed by means of baffles, the whole so designed that dust is electrostatically trapped, passed through tempering coils and then circulated through ceiling ducts.

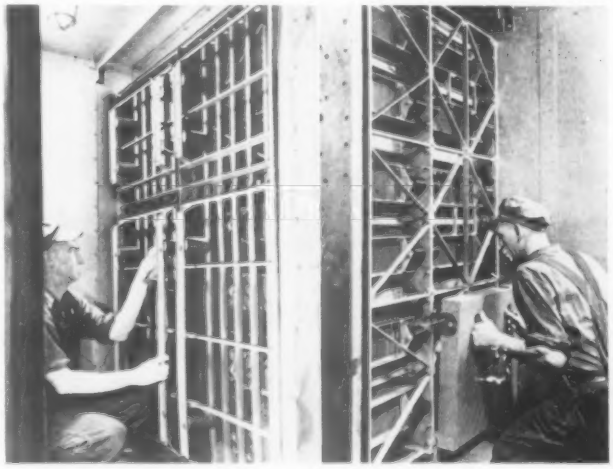


FIG. 2. Checking ionizer assembly of Westinghouse Precipitron electrostatic air cleaner prior to a periodic cleaning.
FIG. 3. Replacing air distribution baffles on the clean air side of the Precipitron electrostatic air cleaner following a periodic cleaning.
FIG. 4. Air borne dust, nemesis of precision work and precision tools, is electrostatically trapped before the air is circulated into the Engineering Research Laboratory.

FIG. 1. Section of Engineering Research Laboratory, Landis Tool Company. Return air grill in far corner, with ceiling duct immediately above.

AUTOMATIC DISHWASHER AND WASTE DISPOSER

Tool engineers who have spelled the silent (?) partner on her night off, and who have thereby gained first-hand knowledge of dishwashing and other household chores, will be interested in the Tools of Today for the kitchen. So, for that matter, will the silent partner.

An entirely new design of a fully automatic dishwasher that takes this kitchen appliance out of the luxury class and into the average home, is to be introduced by Westinghouse Electric Appliance Corporation, Mansfield, Ohio, as soon as full consumer production can be resumed. At the same time, according to J. H. Ashbaugh, vice president in charge of the Division, Westinghouse will produce an electric unit called the Waste-Away, that will grind up garbage and flush it down the kitchen drain.

To operate the dishwasher, it will only be necessary to place dishes, glassware and silver in the square, top opening unit and to close the lid and push a button. The machine will then spray the dishes, wash them and rinse them twice. The machine then cleans and drains itself, and automatically shuts off. Because the water is 150 degrees F.—about 30 degrees hotter than human hands can ordinarily stand—dishes will be far cleaner than when washed by hand.

In addition to being fully automatic, the new dishwasher will have a capacity one-third greater than pre-war models. The cost of the basic unit, without cabinet—i.e., one that will fit into a work surface adjacent to the sink—will be less than $100. Used three times a day, operating cost will be around 16c a month—or at a rate of 2c per kwh.

In developing the machine, dishes have been scientifically "dirtied" by spraying on the stickiest and toughest foods; and letting them dry until, to all practical purposes, they were glued to the dinnerware surfaces. Yet, where a housewife would have to scrape and rub, the dishes were rendered immaculate in one cycle—about 12 minutes per batch—in the automatic machine. Thus, engineering promotes the efficiency of the home as well as the manufacturing plant.

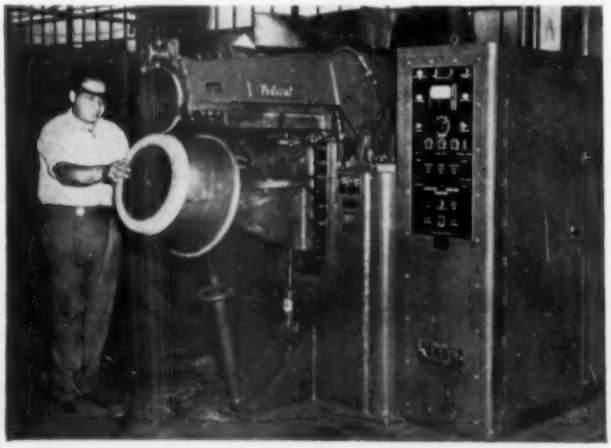
Dishes purposely "dirtied." Gale Idle, Westinghouse engineer, scientifically dirties dishes to prove the efficiency of a new, fully automatic dishwasher. Dishes that, if stacked, would make a pile a mile high, were used in these tests.

At right, testing dishwasher with scientifically dirtied dishes. Over 50,000 dishes, sprayed with the stickiest possible foods, and dried hard, were successfully and immaculately washed with this new Tool of Today for the kitchen.

World's Largest Roll Spot Welder

Speeds up to 300 welds per minute, on .032″ aluminum sheets, are being obtained at the New Kensington plant of Aluminum Company of America on a new Federal Welder, said to be the largest built to date. The machine is provided with Westinghouse electronics controls which charge as many as 84-210 mfd capacitors (10080 mfd) from 1500 to 3000 volts with a peak demand of 100 kva on a three phase system.

A weld is formed each time this change is "dumped" into the welder transformer. The electronics controls for the capacitor assure the right amount of current for consistent welding results whether .032″ sheet or .187″ is being put through the welder. As shown in the photograph, the operator is spot welding a drum, however the machine is adapted to an infinite range of assemblies as well as sheets.



GOOD READING

A Guide to Significant Books and Articles of Interest in the Trade Press

FREE ENTERPRISE RETURNING, a staff written article in October *American Exporter,* is an excellent and, to the advocates of free enterprise, a very encouraging verbal picture of the trend to autonomy of industry. Also, it is an excellent analysis of domestic and foreign trade prospects. While the comments on the practices of foreign importers may seem somewhat prejudiced, figures shown are conclusive and on the whole practical.

INITIAL CONTACT OF MILLING CUTTER AND WORK PIECE, by Dr. M. Kronenberg, in October *Machinery,* deals primarily with one phase of milling—the initial contact between the teeth of a milling cutter and the work being milled. Profusely illustrated, the article presents a comprehensive study of the subject and calls attention to many factors that, so far, have seldom been taken into consideration.

Also, in the same issue, **UNUSUAL RESULTS WITH AUTOMATIC SOLDERING,** by W. R. Graham. The author slates a case history where the elimination of hand work and the need for skill boosted production several hundred percent and also improved the product.

RELATIVE CURVATURE CONTROLS GEAR TOOTH SURFACE STRENGTH, by Ernest Wildhaber in October 11, *American Machinist,* is the second installment of a series on gear generating practices that should be of especial interest to those engaged in gear manufacture, or to those who use gears. The series, which started in the Sept. 27 issue, is authoritative and extremely well considered.

UNCOMMON APPLICATIONS OF HIGH FREQUENCY HEATING, by E. D. Tillson in Oct. 4, *Iron Age,* deals with unusual applications devised by testing lab technicians at Commonwealth Edison Company. Applications run the gamut from tempering of hairpins to golf clubs and include drying collapsible tubes as well as melting wax out of centrifugal casting molds.

METAL MOLD CASTINGS, by D. Basch in October *Metal Progress* (Publication of American Society for Metals), deals with the four types of metal mold castings, viz: Permanent mold castings; semi-permanent mold castings; die castings and their sub-classes and centrifugal castings. The various techniques are comprehensively described, the whole being an important contribution to the art of metal molding. Also, in the same issue, a **SYMPOSIUM ON METAL CLEANING, FINISHING AND PROTECTION.** Contributors include George Onksen, of Solventol Chemical Products, Inc., A. L. Gardner, Pangborn Corp'n, and J. H. Shoemaker, Kolene Corp'n. As the title implies, the article deals with contemporary methods on cleaning, finishing and protecting metal.

DEVELOPMENT OF PATENTS BY SMALL MANUFACTURERS, by William K. Rieber, in October *Product Engineering* gives sound and equitable procedures for inventors and employees in small manufacturing firms, and suggests ways to develop latent values of patentable inventions. Functions of a patent department and patent attorney are also defined.

Also, in the same issue, **CONTROL OF DRAWINGS AND PRINTS IN ENGINEERING DEPARTMENT OPERATION,** by James E. Thompson. The article deals with systems for filing recording, inventory, and print reproduction processes.

MACHINING FIBERGLAS PLASTICS, an article by Harry Crump in October *Machine Tool Blue Book,* is an excellent outline of the tools and methods for machining this highly abrasive material. Various rake angles of drills, lathe tools and milling cutters are described and recommended, along with recommended speeds and feeds.

Diamond Dies Vs Sintered Carbide

The Editor,
The Tool Engineer.

I read with great interest the article "The Elements of Wire Drawing" in the July 1945 issue of "The Tool Engineer," but I cannot fully follow the statements made about diamond dies.

I do not know the limit for drawing dies for drawing iron and steel, but I do know that the present day practice is to draw copper wire below 0.05 inches through diamond dies.

The use of "tungsten steel" as a substitute for diamond is not known to me, but I think that the writer of the article probably meant "sintered carbide" which, of course, contains tungsten but no steel except for impurities due to ball milling.

In my opinion it is not correct to say that diamond dies have been superseded by dies of sintered carbide, and at the present moment we observe exactly the opposite trend, namely that larger sizes of diamond dies are being used.

Yours faithfully,
P. Grodzinski, ASTE Manager,*
Diamond Research Dept.
THE DIAMOND TRADING CO., LTD.
London, England.

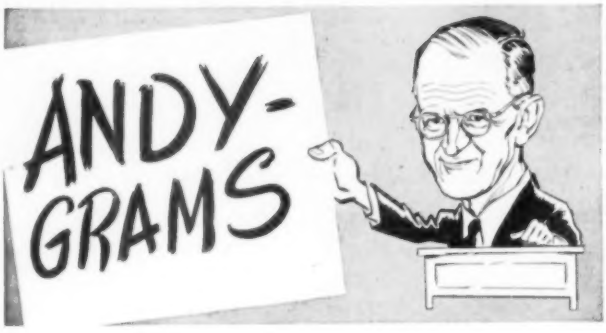
The statement referred to appeared on page 41, July issue, *The Tool Engineer,* and read as follows:

"The dies used for the medium and larger sizes of iron and steel wire are draw plates made from tungsten steel, but finer sizes, as below .0049", are drawn through diamond dies. The coarser copper wires are reduced in chilled iron dies, with the small sizes drawn through diamond dies, as in the case of steel and iron. Latterly, diamond dies—and, for that matter, chilled iron and even tungsten steel—are being superseded by dies of sintered carbide, of the type illustrated in Fig. 6. These dies show wearing qualities quite superior to the chilled iron or tungsten steel, and, cost considered, may be favorably compared with diamond dies."

Apparently, our correspondent misinterpreted the paragraph, which stated that larger sizes of ferrous wires are drawn through plates of tungsten steel, with finer sizes drawn through diamond dies. In the case of copper wire, the reference was to chilled iron dies. There was no intimation that tungsten steel dies are superseding diamond dies, but that the latter are being superseded by dies of sintered carbide. As far as we have been able to ascertain, the trend seems to be toward a greater use of carbide dies, in the United States, for the reasons stated.

Ed.

* *Member A.S.T.E.*



AFTER HECTIC MONTHS, during which my nose had become plenty abraded from close application to the grindstone (no connection with crush dressing) I finally broke away and hied me eastward, there to enjoy the tang of ocean breezes and, incidentally to iodize my system with the piscatorial product of the briny. Oh sure, there was business in the offing, but that was a pleasant prospect along with that of meeting old friends.

Arrived at Boston, brunched at the Parker House, then, to the Pratt & Whitney branch in Cambridge, where Director Bill Young introduced me to his colleagues Gordon Sherlock and Ralph McElroy and, in an adjoining office, to Vascoloy-Ramet's Walter Winfrey. From latter, greetings to Al Conti, V-R representative in Detroit.

Bill drove me out to the Newton Country Club, where Warren Ames hosted at luncheon and then drove me to the B. C. Ames plant, in Waltham, where, for several hours, I watched the manufacture and assembly of quality dial gages and precision bench machines. There's no flies on those easterners when it comes to mechanical ingenuity. They're there!

From the Ames plant, to W. H. Nichols & Sons where, after passing the time o'day with Arthur Nichols, I was turned over to the senior partner, W. H., who took me around the plant. Again, quality! There, pumps, gears and light machinery are mass produced to limits of tolerance that might well extend many a maker of precision gages. Among other things, I watched a Nichols hand miller taking a cut, in steel, that would have been a big bite for a much huskier machine. No growl or complaint, nor even a sign of chatter on the milled workpiece!

The tour over, we rested our dogs up in the Eng'g Dep't, where I met Ch. Eng'r. Harold Lundstrum and the equally capable and likeable Alan Brown. The latter, with Art Nichols, turned the talk to advertising, which is out of my field. But, as the thoughts expressed were in line with other comment throughout the east, I'll generalize on that later.

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Abed by nine, I was up betimes and, after an eye opener of Java at a one-armer, rambled erstwhile cowpaths until b'fast. An hour or so in historic old South Church, then to the Navy Yard to tread the decks of Old Ironsides. A fine ship, the Constitution, testifying to the worth of American shipbuilders and fighters of a bygone day.

From Boston to Providence, where I spent a quiet Sunday with old friends, yet, managed to pick up considerable material for future articles. Monday A.M., to Brown & Sharpe's, where I spent a pleasant hour with B. P. Graves, Director of Design, and Harold Sizer, the latter conducting me through the Gear Div'n and suggesting notes for a coming symposium on gears. Before leaving, I had the pleasure of renewing acquaintanceship with B. F. (Ben) Waterman, sup't of the B & S Gear Div'n when I worked there some forty years ago. Also, with L. D. Spence, for whom I've also had a warm spot in my heart these many years and who is now training his son, a fine young chap, for a position of responsibility. And that's one thing I like about the eastern concerns; there a man makes his employment a career, grows old in service and trains his son to carry on traditions of quality. No squabbling about seniority!

From Brown & Sharpe's, bussed out Auburn way to visit with W. H. Cotter, Jr., up 'n coming sales mgr. for Standard Machinery Company. It should interest you boys North, East, West and South that Standard Machinery has a movie on swaging techniques that is highly educational and well worth seeing. Program Com'tee ch'men take note and act accordingly.

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Rounding out the day, shuttled over to Federal Products Corp'n, where I found 'em adding to the South Providence plant although I'm not certain whether they were expanding or putting it all under one roof. Maybe both. Mine was a deferred visit with L. C. Tingley, Federal prex who is the only one left of the old M.A.N. Mfg. Co., where I worked as a tool designer back in '10 and which was the parent of Federal Products. It's grown plenty since! Anyway, we reminisced about old times, and before I left I. A. Hunt, adv'g mgr., dropped in, when the talk turned into other channels.

From Providence to Hartford via bus. Last time I travelled the old Danielson pike was by horse and buggy, the wheels sloughing through rutted mud. Now, it's a smooth ribbon of concrete on which a limit of 34-40 m.p.h. seems slow compared to the reasonable no-speed-limit on Michigan state roads. But, the vistas are as broad, and bluff Autumn's motley coat draped the hills in a riot of color. Mill villages, Danielson, Willimantic, all looking the same but more weathered.

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Then, the broad expanse of the Connecticut river, and Hartford, now streamlined for automobile traffic but otherwise looking about the same as when I left there 35 years ago. First thing I did was to call up Ray Morris, who took me to lunch at the City Club. Unfortunately, I had partaken of lobster Newburg, the day before, without duly investigating the critter's age, and as a result, felt as though I'd swallowed an elevator. So, I had to stick to plain grub and mighty little of that. And I'd set out to get fat on the trip!

The elevator bobbing up and down, I retired for the afternoon and supped on thin soup and crackers. Up went the elevator! That evening John Sundkvist, with whom I'd worked at the old Pratt & Whitney plant, dropped in and played nurse. Then, lulled into forgetfulness of the rebellious lobster, to sleep until Aurora—or was it Eos ?—teased me to wakefulness. Somewhat on the mend, I hied out to the Pratt & Whitney plant in West Hartford, there to visit with Sales Mgr. Ed. Shultz, to whom I am indebted for many courtesies.

Through him, I crashed the barriers into the inner sanctum, where I found Irwin Holland in conference with Chas. M. Pond and, in view of pressing problems on the home front, unable to attend the Directors' meeting in Detroit. Pratt and Whitney and the A.S.T.E. are to be mutually congratulated in having a man of Irwin Holland's caliber in their respective organizations.

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For lunch, some more thin soup, then a wobbly hunt through nearby antique shops that netted a fine 1871 Springfield-Remington carbine to my gun collection. During the afternoon, John Sundkvist called and took me out to the American Tool Works, which he and his big brother Eric (John's a mere 6 ft. plus) started some years ago. If not so big, com-

parts to Willow Run and such *novae* it is still something to be proud of. Through a masterly knowledge of fine tool making, precision workmanship and ingenious methods, the Sundqvist brothers have earned an enviable reputation in the fine tool field.

That evening, I was invited out to John's home, where Mrs. S. had spread a dinner that, ordinarily, would have tempted me to satiety. To wind up, there was blueberry pie! —of all desserts, my favorite! But, the mind taking mastery over matter, I asked her to wrap it up (imagine the nerve!) along with a couple of her home made rolls. But, that was the turning point and, after a round of conversation that lasted until midnight, I went back to the hotel fully confident that the worst was over. Awake at dawn, I reverently unwrapped the pie and—Dear Mrs. S., it was perfect! The rolls I consumed as a bedtime snack after retiring in the Pullman, the following night—and were *they* good! *Tusen tack!*—which, translated, means a thousand thanks.

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Thursday A.M., to Bridgeport and the unveiling of the Bullard Man-Au-Trol. Of that, a full account in the editorial section, this issue. Arrived at the Bullard plant, I was made at home by Payse Blanchard, with whom, among other things, I exchanged comments relative to the reinstatement of the Bridgeport tool engineers into the A.S.T.E. Well, a lot of water has rolled over the dam since the late '30's, and personally, I'd like to see the Bridgeport boys back in the fold. They belong.

Toured the plant with Bob Bullard, young scion of the line who is destined to carry on the family traditions for fine machine tools and who will be heard from plenty in the years to come. As for the Bullard plant, the visitor is impressed with the precision workmanship and high quality of product that is characteristic of most American machine tool plants. In the course of the afternoon, met E. Payson Bullard, Pres. Gen'l Mgr., Ted Bullard and Ed Bullard, Ch. Eng'r and designer of the Man-Au-Trol. A swell job!

To my keen regret, I had to forego the clambake the Bullards had put on for the visiting press representatives. But, wishing to get back to Detroit in time for the Semi-Annual, I made an early departure, arriving in New York in good time for dinner before entraining. Back in town Friday afternoon, I found a week's accumulation of mail, disposition of which will have to wait until we put the book to bed. However, I was pleasantly surprised by a birthday card from John Sylvester, of Boston, as well as by a li'l contribution from Boston's versatile gadgeteer, Walter Pohle. Thanks to both!

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Immediate chores disposed of, I crashed the Director's meeting in time to hear Bob Douglas flaying the boys for their "craven subservience to the letter of the law," or something like that. Now Bob! But, variety being the spice o' life, Bill Dawson quoted Shakespeare, thereby interjecting poetry into the prosaic atmosphere of the meeting. They grow on you, those Canadians. Fine boys! Missed Directors Fields, Goodfellow, Jones and Siefert, and Carl Holmer, who'd gone back to Peoria, but the rest were there going strong for country and the A.S.T.E. Was agreeably surprised to see George Wise, of Twin Cities, with whom I was co-Director some years ago, also Al Mitchel, of Syracuse, and Ed (Old Man) Doogan of St. Louis, whom I hadn't seen since we coffeed at 3:00 A.M. at the Toronto meeting several years ago.

Also met Hoyt Turner, ch'man of Houston Chapter, with whom I relayed greetings to Red Cole and Rip Collins, and Earle DeBisschop, ch'man of Rochester Chapter. During the meeting, Herb Hall asked me to go on the Program Com'tee, which same I refused a/c not caring to risk the extra straw. But, I saw W. B. (Slim) McClellan of Detroit and Ed Murphy of Newark on his list, and if he picks men like that he'll have an A-1 committee. Later, in the evening, met Carl Christensen of Bridgeport, the latter raising my hopes of a reconciliation with our friends down by the Sound. Come on, Bridgeport, let's get together! We'll all be the stronger for consolidation.

A resumation of business Saturday A. M., then, at noon, the Semi-Annual dinner, during which Prex Clete Briner introduced Wm. Stout, prex of the Swedish Eng'rs Soc'y, Stockholm, as guest speaker. As usual, the versatile Bill inspired us with visions of marvels to come—all of which, of course, will have to be *tool engineered*. As a diversion, we were entertained by Bob Kuntz, Sec'y of Dayton Chapter whose deft hands are plenty faster than the eye. If I could master some of his tricks with cards I'd ride Bill Smila to a fare-thee-well!

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Well, I've covered quite a bit of territory although, even with an extra page, I can only recount the high spots. For the benefit of all, who have contributed to the success of the TOOL ENGINEER, however, I want to say that our magazine is evoking a reader enthusiasm and acclaim beyond our fondest expectations. As one executive said, during my tour, "That's one magazine I am proud to display in our lobby. It stands out, and every page is an invitation to turn to the next." And, another: "We are proud to be an advertiser in a magazine of such outstanding quality."

One thing, that met with practically unanimous approval, was the segregation of advertising and editorial contents. As a matter of fact, that move was prompted by an insistent reader demand, and personally, I'm for it. During many years in the plant and engineering office, it was my habit to digest the pertinent editorial contents, without distraction from advertising, and then to thoroughly go through the ads. And that is the routine followed by the great majority of plant executives who, if they do not personally sign the purchase orders, certainly specify the tools and equipment that is to be bought.

To these men, who constitute a very considerable proportion of our vast membership and other readers, the advertising pages in the *Tool Engineer* are "must" reading. To progressive executives, who must keep abreast with the latest, the advertising section is just as important as the editorial contents. But, they don't want them mixed. By segregating these departments, then, we have made it easier for our readers to concentrate on the ads, the while greatly enhancing their value. The move is a good one, certain to net commensurate returns to sellers and buyers alike.

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One thing more. We have been literally swamped with releases on manufacturers' representatives in local areas, and as extended in answering requests for information as to who handles what in a particular area. That, however, will soon cease to be a problem. The Society is coming out with a national roster, and it is proposed to set up advertising so that representatives of every advertiser will have his jobbers, agents or representatives listed under every Chapter. By the time the roster goes to press, that will include about four score of the leading industrial centers in the United States and Canada—and, perhaps, other countries. Under this plan, the A.S.T.E. Roster will be an invaluable source of information in the field of Tool Engineering.

Andy

BULLETINS AND TRADE LITERATURE

Items briefed herein have been carefully selected for their interest and application. Unless otherwise stated, all are available, free, from the stated sources.

Catalog No. 45, by **SHOOK BRONZE CORP'N.,** Lima, O., describes the complete line of *Shook bronze bushings, bearings, bar stock* and *babbitt,* with listings of finished bushing sizes.

WALES-STRIPPIT CORP'N., North Tonawanda, N.Y. has issued a second edition of Catalog S, describing the Wales *stripping units* for use with conventional dies.

A Bulletin by **W. C. DILLON & CO.,** 5410 W. Harrison St., Chicago 44, describes the *Dillon Dynamometer* and its applications for precision testing.

Bulletin B-1, by **GREENE, TWEED & CO.,** Bronx Blvd., at 238th St., N.Y. 66, describes the Basa replaceable face hammer.

An attractive 12-page color folder, by **MUSKEGON MACHINE CO.,** Newberg, N.Y., describes the *Linderman Automatic wood fabricating process* and machinery which is discussed in the editorial section, this issue The Tool Engineer.

A series of Bulletins, by **GENERAL MILLS, INC.,** Minneapolis 13, gives a comprehensive outline of the metal working facilities of the corporation. Contrary to general impression, General Mills has developed into a remarkably efficient industrial unit during the war, and its mechanical division now compares favorably with the best in the metal working field.

Depreciation—Graveyard of Dividends, by Joseph L. Trecker, Pres., N.M.T.B.A., sets forth considerations of vital import to key men in industry. A booklet, available from **KEARNEY & TRECKER CORP'N,** Milwaukee.

Alloys, a bulletin by **BALDWIN LOCOMOTIVE WORKS,** Philadelpha, is an engineering reference catalog dealing with Brass, Bronze and Iron Alloys showing composition, applications and physical properties.

HARTFORD CHROME CORPORATION, 525 Park St., Hartford, Ct., has compiled a survey on uses and applications of *Hard Chrome Plating* in the postwar.

JAMES H. KNAPP CO., 4920 Loma Vista Ave., Los Angeles 11, has issued a bulletin describing the *Pre-Selectric Power Feeder* shown in the Tools of Today pages, this issue, The Tool Engineer.

CHICAGO TOOL AND ENGINEERING CO., 8383 So. Chicago Ave., Chicago 17, has issued literature covering its *underwater cutting* and *Welding Methods.*

SUPERIOR BEARING BRONZE CO., 140 Banker Street, Brooklyn 22, N.Y. has issued a brochure dealing with the machining and finishing of *Magnesium Castings.* The editorial matter covers machining, recommended speeds and feeds, finishing and methods of erosion prevention.

Bisco Tool Steel Tubing, with uses and applications, is described in a bulletin by **BISSETT STEEL CO.,** 945 E. 67th St., Cleveland. Contents include heat treating and a current list of available sizes.

A bulletin by **JUNKIN SAFETY APPLIANCE COMPANY,** 10th & Hill Sts., Louisville, Ky., describes the *Junkin Safety Guard* for power presses.

A 28-page brochure, by **ALLIED PRODUCTS CORP'N,** Detroit, profusely illustrates and describes the company's facilities and capabilities as a producer of tools, dies, jigs, fixtures and plastic molds.

UNITED ELECTRIC COMPANY, 69-71 A Street, Boston 27, has issued a condensed catalog and price sheet covering its line of electrical controls, thermostats and pressure switches.

ALLEN BILLMYRE CO., 431 Fayette Ave., Mamaroneck, N.Y., has issued Bulletin F-4 describing its line of Exidust Portable Vacuum Cleaners for industrial uses.

The **CARLYLE JOHNSON MACHINE CO.,** Manchester, Ct., has issued Installation and Data Book No. 45, describing its line of *Maxitorq* floating disk clutches.

ENGINEERS SPECIALTIES DIVISION, 980 Ellicott St., Buffalo 8, N.Y., has issued a bulletin describing *Detail Glass* and the *Universal Layout Scale for Form Grinders.*

THE HUNGERFORD RESEARCH CORPORATION, Murray Hill, N.J., has issued a 16-page booklet explaining its services in the development of new and improved products. The organization specializes in the application of powder metals and plastics to mechanical and electrical equipment.

A booklet, by the **DOALL COMPANY,** 1301 Washington Ave., Minneapolis 4, describes *Friction Sawing*—what it is and what makes the saw cut. The booklet includes a Job Selector Chart and covers applications of friction sawing of various materials, including hardened steel.

WILLEY'S CARBIDE TOOL CO., 1340 Vernor Highway, Detroit 1, has issued a bulletin describing its line of standard carbide blanks and carbide tools.

Catalog No. 76—*Colmonoy*—by **WALL COLMONOY CORP'N,** 720 Fisher Bldg., Detroit 2, describes Ferrous Alloys and *Colmonoy Hard Facings* and methods of application.

AMERICAN EMERY WHEEL WORKS, Richmond Square, Providence 1, R.I., has issued a guide to grain and grade selections for abrasive accessories for portable tools.

FEDERAL PRODUCTS CORP'N, 1144 Eddy St., Providence 1, R.I., has issued several new bulletins describing its lines of *Visible Single Purpose Snap Gages,* the Federal *Metricator System,* for gaging air, the Model 12- B-1 *Micrometer-Comparator* and the Model 130 Foote Pierson *Electronic Gage.*

A 96 page handbook—**EASTERN STAINLESS STEEL SHEETS,** should be of particular interest to readers having to do with processing of stainless steel. The book covers application in various industries, the properties of stainless steel and corrosion resistance. It also includes extensive data on gages, finishes, tolerances and processing in addition to general reference tables.

The book, which is available on request from Eastern Stainless Steel Corp'n, Baltimore 3, Md., was written by Henry Schaufus, chief metallurgist of the company, and produced by the John Mather Lupton Co., advertising agency for E.S.S.

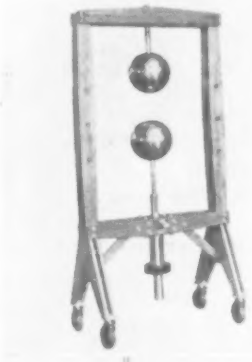
THE FOUNDATION SURVEY, an Industrial Planning Conference Manual published by the Management Research Institute, 250 Park Ave., New York 17, is a complete guide to progressive industrial postwar planning of production and sales using the Conference method. Primarily intended for consideration by Management and executive engineers, the Survey introduces specific plans for improvements in production and sales methods.

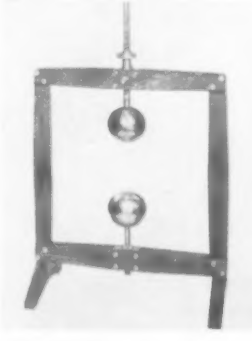
TOOLS OF TODAY

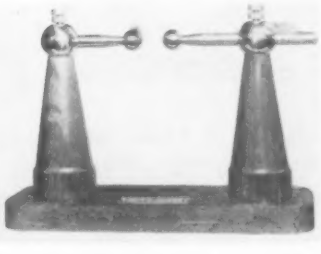
Sphere Gaps For High Voltage

A COMPLETE LINE of SPHERE GAPS, for accurately gaging high voltages used in a-c or d-c testing, is announced by *General Electric's Transformer Division*, Pittsfield, Mass. In addition to providing the most direct and accurate method of gaging test voltages, the gaps serve as protective devices to prevent overvoltage on test specimens or apparatus during high-potential testing. In addition to the above advantages, they indicate crest voltage regardless of wave form, and are relatively unaffected by humidity changes in the air. They have practically no time lag, and spark-over voltages are very consistent.

They are available in standard diameters of 2, 6.25, 12.5, 25, 50, 75 and 100 centimeters, for spark-plug voltage ranges of 8.5-45 to 261-13 38-kv crest, and are furnished complete with current-limiting series resistance assemblies. The 2 and 6.25 cm gaps are both of the table type, with electrodes mounted horizontally in wooden supports. The larger sizes are of the floor type with highly polished spheres mounted vertically in a rectangular frame. All of the sphere gaps are provided with precision adjustment for gap spacing. Sphere gaps of 25 cm and larger can be provided with casters for easy mobility, and a motor drive for gap adjustment if desired.



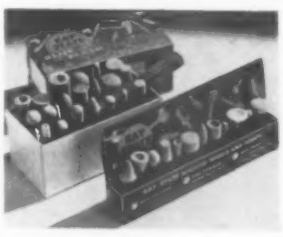




New Bay State Utility Set

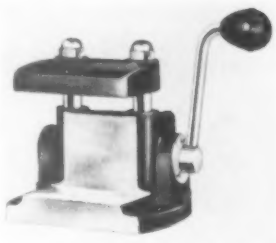
A NEW COMPACT package of 12 mounted wheels and points, in sizes most commonly used, is now offered to supplement their present utility set of 20 mounted wheels and points by the *Bay State Abrasive Products Company* of Westboro, Mass.

The UTILITY SETS are colorfully and protectively packaged in narrow one-piece boxes for the set of 12 and in two-piece packages for the set of 20. A red and blue design again a shiny black background easily identifies these Bay State products.



Miniature Pump Jig

A MINIATURE PUMP JIG, especially designed for the directing, reaming, tapping or counterboring of small parts, is a recent product of *Siewek Tool Division* of Domestic Industries, Inc., 231 South LaSalle St., Chicago. While of miniature size, this jig incorporates all of the good features of the Siewek line of pump jigs.



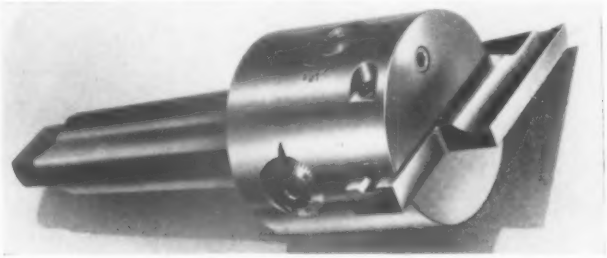
New Boring Tool Eliminates Chatter

Behr Products Company, Warren, Michigan, has just completed tests and development work on a new and greatly improved BORING BAR.

This new tool is designed in two standard head diameters —2" and 3½"—for use on vertical or horizontal lathes, screw machines and all types of precision boring machines.

Tests indicate that the new Boring Bar eliminates chatter, takes a faster feed and up to four times wider cut than average tools—greatly increasing production and at the same time reducing tool bit grinding.

The tool is extremely rigid and rugged in construction and has an accurate micromatic blade adjustment. Blades are available in a full range of sizes either Tungsten Carbide tipped or faced, or in high speed steel.



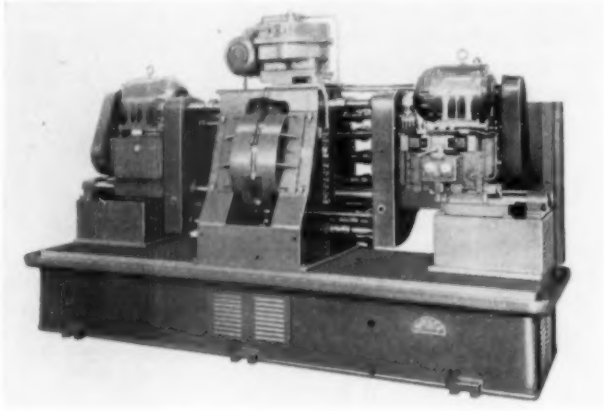
Triple Cut Specimen Shear

The Taber Instrument Corporation, North Tonawanda, New York, announce their new TRIPLE CUT SPECIMEN SHEAR, Catalog No. 104-11.

This Shear was designed for use with the Taber V-5 Stiffness Gauge to assure accurate cutting of test specimens (1½" x 2¾") for uniform and comparable test results. Its use is recommended especially for shearing very thin specimen materials which if not cut to precision may affect the test results. The Shear will cut .020" paper, plastic or thin metallic sheet and foil in preparation of stiffness or resilience test on the Taber V-5 Stiffness Gauge.

Snyder "Special" Hollow Miller

Snyder Tool and Engineering Co., 3400 E. Lafayette, Detroit 7, Michigan, has designed and built a SPECIAL-PURPOSE, DOUBLE-END MACHINE for hollow milling one or two trunions on converter blades of various shapes and sizes. The machine is comprised of two Snyder self-contained hydraulic units and multiple heads, and an electrically driven fixture trunion with holding jaws, all assembled on a welded steel base. The coolant tank is in the rear of the base.



Tool spindles are guided in the trunion side members and are equipped with precision and stop adjustment to maintain accuracy and depth of cut, with the trunion indexed, station to station, by a Geneva index mechanism mounted on top of the trunion assembly. Parts are located in the jaws by means of two side locating plates, each fixture having an individual hydraulic cylinder which automatically clamps the part while the fixture indexes from loading station to first working station.

Each index station has three fixtures holding three parts, each of which is identically machined at the same time. The work-cycle consists of an index followed by the tool work and is semi-automatic, requiring the operator to press a button after loading three pieces. Unloading is automatic. Work parts of various shapes and sizes are accommodated by exchanging the holding jaws on the fixture and adjusting the side locating plates. Production is 575 units an hour at 80% efficiency.

New Snap Gage By Federal

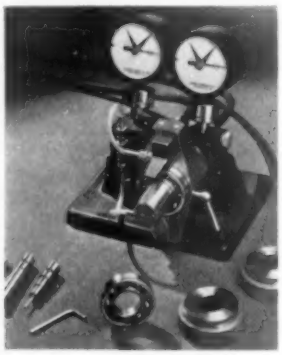
CLAIMED TO BE one of the most revolutionary instruments in the snap gage class, the new MODEL 1340 SNAP GAGE by *Federal Products Corp'n*, Providence, R.I., positively defines that there is a variation in the specified dimensions and, in addition, tells how much the dimension varies.

The instrument is a single-purpose type of gage, the dial of which is graduated in .0001", with a range of .008". It fits the hand comfortably, is handled in an entirely natural manner, weighs only seven ounces and can be made to suit any dimension between ⅛" and 1⅝".

One feature is that the weight of the gage rests on the rigid upper anvil, therefore, it cannot influence the Indicator reading. The lower anvil is a flexible piece of metal which transfers the variation in the dimension from the workpiece to the Dial Indicator. Both anvils are tungsten carbide tipped for long wear; in addition, the gage has an insulating finger grip.

New Air Gage Inspects I. D. and O. D.

Moore Products Co., H & Lycoming Sts., Philadelphia [illegible], has added a new AIR GAGE to its line of Pneumatic Comparator Gages. The new gage is for simultaneous inspection of I.D. and O.D., and has an adjustable feature which permits its use on a wide range of sizes in both dimensions. The model shown, which is set up for inspection of a 35 MM ball bearing (72 MM O.D. race) to tolerance of .0003", will accommodate work with bores as small as .150" and outside diameter of ⅝" to 3⅜".

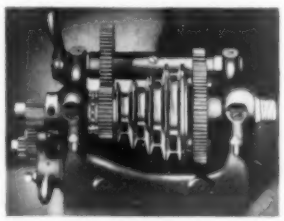


The O.D. gaging jaws, which are adjustable over the full range of outside diameters, and the interchangeable plugs which measure the I.D., are both equipped with pneumatic gaging nozzles. These nozzles do not touch the work being checked. Reference surfaces for use in setting the gage, are provided on the jaws behind the gaging position.

V-Belt 9" Lathe By South Bend

A NEW V-BELT DRIVE 9" PRECISION BENCH LATHE is the latest addition to the tools of *South Bend Lathe Works*. Made especially for those who prefer the V-belt drive, this bench lathe features 4-step, V-belt cone pulleys which, with the back gears, provide either 8 or 16 spindle speeds ranging from 46 to 1176 r.p.m. It is made with either q.c. or plain change gear equipment for a wide range of thread cutting and power feeds. Two of the models incorporate power cross-feed.

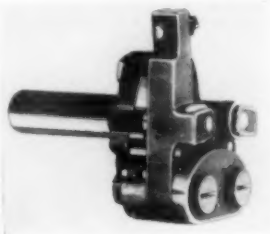
Outside of the change in drive—of which the headstock is illustrated—and other recent improvements, these lathes are largely similar to the flat belt 9" South Bend Lathes, and the usual line of practical S-B attachments is available for special classes of work. Complete details of this popular 9" precision lathe are contained in Catalog 9-G. Copies may be had by writing the manufacturer at 417 E. Madison Street, South Bend 22, Indiana.



New Boyar Schultz Knurling Tool

MODEL K KNURLING TOOL, newest addition to the B-S line of screw machine tools manufactured by *Boyar-Schultz Corporation*, Chicago, possesses advantages said to be found in no other tool designed for similar work. One feature and an outstanding feature is knurling between and behind shoulders when necessary. Operating from the centerline of material, regardless of diameter, the usual disadvantage of "Knurl climb" is eliminated.

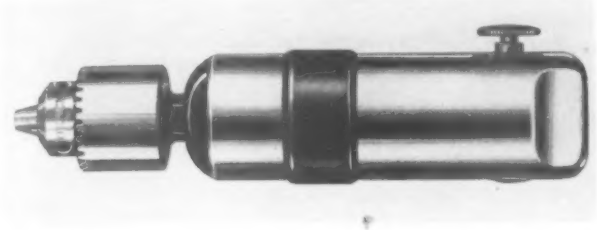
The tool operates from the screw machine turret, with feed and pressure simultaneously applied to both sides of the work, through cantilever action principle, to exactly the same depth at equal pressure. This action is particularly advantageous when knurling long work, as it avoids the transverse strain and springing of the spindle, a common complaint when pressure is applied from one side only. The tool is made in three sizes—00K, from 0" to 3/8"; 0K, from 3/16" to 5/8", and 2K, from 1/4" to 7/8"



8 New Drills By Aro

EIGHT NEW DRILLS of 3/16" and 1/4" capacity, have been added to the Aro line of precision-built pneumatic tools produced by *The Aro Equipment Corporation*, Bryan, Ohio. These drills which embody features for powerful, stall-proof operation combined with light-weight construction to lessen fatigue are especially suited to assembly operations where they contribute greater speed and efficiency to production. These drills include MODEL 209, with button throttle, and MODEL 309 with lever throttle. They have aluminum housing, 3/16" or 1/4" chuck, and weigh 1 lb. 3 oz. These are straight-type drills, 2500 R.P.M.

MODEL 2013 is similar to model 209, except that it offers speed of 4000 R.P.M. Likewise, MODEL 3013 is similar to model 309, with a speed of 4000 R.P.M. MODEL 2010 comes with button throttle and model 3010 with lever throttle. Both operate at 2500 R.P.M., have aluminum housing and handle, 3/16" or 1/4" Jacobs Chuck and chuck guard. Weight, 2 lbs. 1 oz. MODEL 2014 is similar to model 2010, except that speed is increased to 4000 R.P.M. and MODEL 3014 is similar to model 3010, with a speed of 4000 R.P.M. Standard equipment with all eight models includes 8 feet of 1/4" hose with 3/8" and 1/4" male fittings on ends.



Pre-Selectric Power Feeder

PRECISION CONTROL OF deep hole drilling of small holes in metal, wood or plastics is provided by the Knapp PRE-SELECTRIC POWER FEEDER, which automatically duplicates the operations of a skilled mechanic when deep drilling or tapping small holes. The device provides automatic chip clearance at pre-selected depths during the drilling or tapping operation.

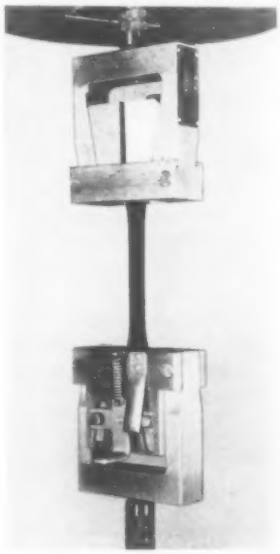
The machine mounts by a bracket on the drill press column and by attaching a collet to the drill press spindle feed shaft. Positioning of the power feeder is not critical, being governed by the alignment of the collet with the spindle feed shaft. The weight of the unit is balanced on its support arm, no weight being added to the drill press spindle feed shaft bearings. Installation can be accomplished in less than ten minutes by one man.

It is claimed that the "Pre-Selectric" feeder will consistently drill No. 50 holes through alloy steel plate, to the full length of the drill, without drill breakage and with substantially less dulling of the drill than when controlled by hand.

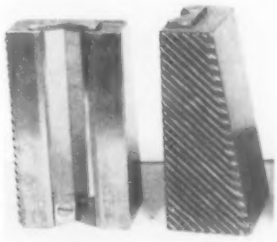
The unit permits hopper-feed of work to the drilling fixture with the operating cycle controlled by energizing a circuit through the Pre-Selectric Power Feeder to assure proper positioning of the work, with electrical interlock. The device is fully described and illustrated in a bulletin which may be obtained from *James H. Knapp Company*, 4921 Loma Vista Avenue, Los Angeles 11, California.

Midget Testing Gage

SINCE ITS INTRODUCTION about four years ago, a *midget testing gage*, the size of a postage stamp, developed by the *Southwark Division of Baldwin Locomotive Works*, Philadelphia, has been used for determining stresses and strains in hundreds of different applications. Solving engineering problems heretofore considered impossible, the new gage was the basis for a conference of research engineering recently held in New York to determine further uses and applications.



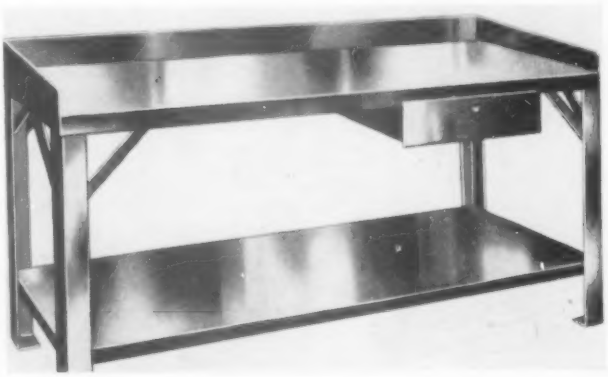
The Southwark Division, which also manufactures the SR4 Strain Gage, has designed a special plastics grip on the Templin principle, for use with the Universal Testing Machine. The new grip, of 5,000 lbs. capacity, is self-aligning, swiveling and laterally, is especially good for gripping the glossy hard surface of some plastics.



Another important development, in view of the fact that the sharp trend to plastic products creates a demand for testing equipment especially designed for these materials, is a new wedge grip with a replaceable file face, for use in testing machines up to 300,000 lbs. capacity. This feature saves the replacement of an entire grip when the teeth are worn or broken. They are available in both the flat type, for tension testing of flat specimens, and the Vee type for testing round specimens. Since tooth spacings of ten, sixteen and twenty-five to the inch are available, the new grips make it practical to keep a stock of faces adaptable to various types of materials.

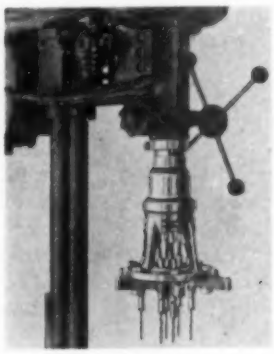
Improved Steel Work Bench

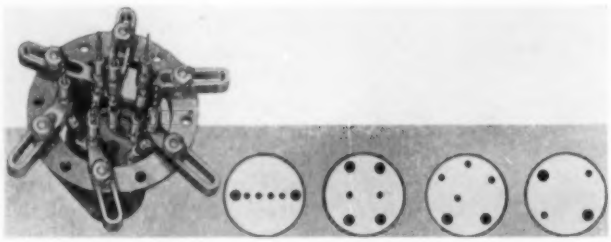
STREAMLINED DESIGN, sturdier construction, and numerous available extras, are features claimed for the improved Equipto 12-gauge STEEL WORK BENCH by Equipto, Division of *Aurora Equipment Co.*, Aurora, Illinois. The bench is available in 42 inch and 6 foot lengths, 34 inches high and 28 inches deep, and is highly suitable for both work bench use and for supporting light machine tools. The four feet have holes to permit fastening to floor if desired.



New Multi-Drill Attachment

THE *Commander Manufacturing Co.*, 4225 West Kinzie Street, Chicago 24, announce the **"MULTI-DRILL,"** a new six spindle, universally adjustable multiple spindle drilling attachment that can be easily and quickly installed on most types of drill presses. It comprises a driving head with six movable spindles, each of which is located by an individual radially adjustable arm. This design permits the ready positioning of drills up to 17/64" diameter in any hole pattern, including a straight line, within a 5" diameter circle with minimum distance between centers of 11/16". From one to six holes can be drilled simultaneously in one stroke of the drill press. The housing for drive gears, and the supporting frame and adapters, are of special high strength aluminum alloy. The entire attachment weighs only thirteen pounds. Modifications are also obtainable for special applications.



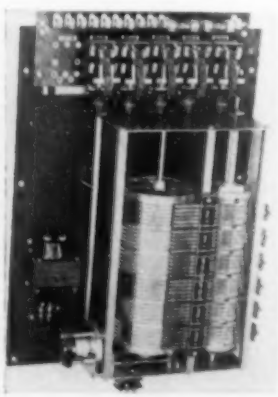


New Traffic Control System

A NEW PROGRAM DEVICE which permits changes in timing of traffic control systems as often as every 12 minutes a day, for six days without repetition, has been announced by *General Electric's Lighting Div'n*, Schenectady, N.Y. This device supervises the functions of the master controller in an interconnected traffic control system and can be furnished to take care of any number of circuits.

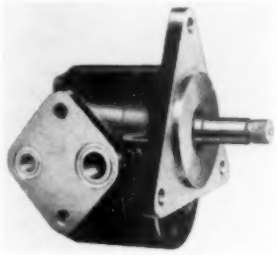
The device has a weekly program cylinder which permits the six different programs to be spread out over a weekly period by making one of the programs do for two days. In addition, a program which takes into account seasonal, special event, and holiday variations in traffic conditions can be set up twelve weeks in advance on the weekly cylinder.

The equipment, driven by a Telechron synchronous motor, can be housed with the line relays in a standard 27-inch controller box for outdoor installation, or it can be mounted on an indoor central-station-type master control panel. It is considerably less complicated and much more practical than the large number of time switches otherwise needed to perform the same function. In addition, a multiplicity of wiring needed to connect time switches is eliminated and, furthermore, different circuits can be set to operate simultaneously. While designed for traffic control, the system seems to offer broad possibilities in interplant traffic control and for other timing and signalling applications.



New Hydraulic Pump

UNUSUALLY HIGH volumetric efficiency features are claimed for a **GENERAL PURPOSE HYDRAULIC PUMP** announced by *Pesco Products Co.*, Cleveland (division of Borg-Warner). Thorough calibrations show volumetric efficiencies of 95 per cent and better at 3000 RPM under pressure of 1,500 pounds per square inch. The gear-type pump, incorporating the exclusive "Pressure-Loading" principle of the PESCO aircraft pumps, is suitable for universal application where hydraulic power is utilized. It has a triangular mounting pad, or SAE magneto flange, or it may be readily adapted to other design mounting for special installations. Capacity rating is 3.5 gallons per minute at 1,500 RPM or seven gallons per minute at 3,000 RPM.



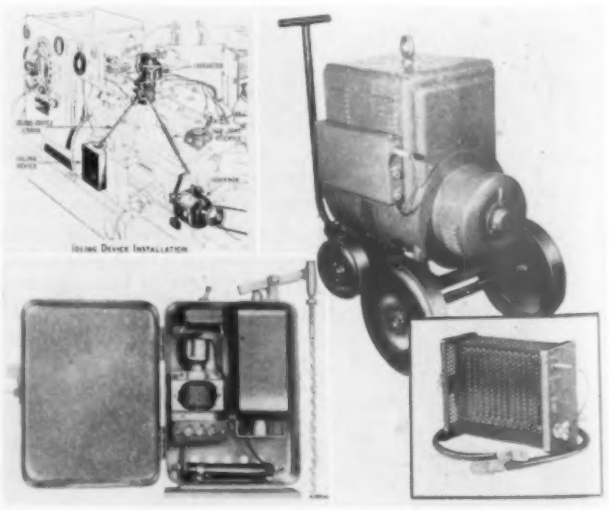
Descriptive literature is available upon request to the maker, 11610 Euclid Avenue, Cleveland 6, Ohio.

New Developments By Hobart Bros.

RECENT DEVELOPMENTS by the *Hobart Brothers Co.*, Troy, Ohio, include a new 3-step **THINWELD ATTACHMENT** (shown at right in the composite photo) and an **ELECTRIC IDLING DEVICE** (lower left) for use with gas engine driven arc welders. The latter, which is shown installed at upper left, is a mercury-type idling device which automatically shuts down the gasoline engine to idling speed 12 to 15 seconds after the operator has stopped welding.

To bring the engine to normal running speed, the operator merely strikes an arc. The idling device and governor are linked with the throttle in such a manner that the device can close the throttle independent of governor resistance. When welding, the governor controls engine speed without interference from the idling device, which may be made inoperative by opening an off and on toggle switch. This does not affect the welder or engine operating characteristics.

The Thinweld attachment gives wider range to standard arc welding machines and makes it possible to weld from 10 amperes up through the maximum rating without any dead spots in the complete welding range. It is claimed to be an ideal attachment for arc welding machines being used in widely diversified fabricating plants and job shops where the work may vary from extremely heavy to the lightest gauges practical for welding.



A.S.T.E. NEWS

NEWS OF INTEREST AND ABOUT MEMBERS

SOCIETY PLANS POSTWAR PROGRAM AT SEMI-ANNUAL MEETING

Board of Directors Endorses 1946 A.S.T.E. Industrial Exposition

A FULL AGENDA OF IMPORTANT business was cleared at the Society's Thirteenth Semi-Annual Meeting held October 12-13 in the Fort Shelby Hotel, Detroit. The meeting was the first to be conducted under the recently-adopted Constitution and By-Laws.

Partial lifting of rigid governmental restrictions permitted the attendance of Chapter officers in addition to Directors and National Committee Chairmen.

Immediately after convening, the entire gathering visited the National Headquarters offices in the Penobscot Building to observe the physical changes recently inaugurated.

Partitions Removed

Several departmental partitions have been demolished, creating a large general office. Enlarged quarters for the accounting division will house the various units of the mechanical equipment being leased to handle bookkeeping, addressing, and address change operations.

More space has been allotted to the Handbook staff, and the *ASTE News* Editor has been established in the Society's editorial offices on West Lafayette, consolidating all of *The Tool Engineer* staff under one roof.

Resuming its meeting, the Board of Directors, chairmanned by President C. V. Briner, received reports from the several committees. Notable among these was Editorial Chairman G. J. Hawkey's splendid account of the status of *The Tool Engineer* since the Society assumed its publication in February. Despite the many problems and hardships encountered in launching the enterprise, each of the six income-producing issues has shown a profit, the September issue realizing more than eight times the net gain from the first issue. Such a record would be unusual in any business, even at the end of the first year of operation.

Editorial content is never less than 40%—a large percentage in this field—and has met with high favor among our readers. Incorporation of *ASTE News* in the magazine affords opportunity for regularly publicizing Chapters and individual members. With increased co-operation in the field, this section can become even more effective.

Good Paper Commands Premiums

Quality has been maintained in the face of premiums for the scarce, high-grade enamel paper used, and the limitations of our paper quota. With WPB's removal of magazine paper quotas, eight pages were added to the September issue and another eight to the October number.

Public Relations Chairman A. F. Denham made a number of thought-provoking recommendations concerning public relations policies. His report also included suggestions for the national committees functioning in co-operation with his committee in accordance with the Society's organization chart. Far-reaching in significance and importance, these proposals were referred to the Constitution and By-Laws Committee for futher study and report.

A wide range of activities was covered in the comprehensive report submitted by Education Chairman O. W. Winter. He commented on the encouraging progress being made in introducing tool engineering courses in vocational schools, colleges and universities. He cited Chapters active in furthering education in our field through assisting in the establishment of technical courses or through presenting educational programs. Greater Chapter support is necessary, he said, in carrying out the Society's educational projects.

"Until we engage in and support technical research in tool engineering, we are not fully a professional engineering society. Such an activity with ASTE-sponsored laboratories in our engineering colleges would accomplish wonders for our professional program," Mr. Winter predicted. Referring to the Institution of Production Engineers in England, he pointed out that this organization has achieved professional recognition with both government and industry. It conducts an extensive educational program and a research bureau equipped by industry, and is now becoming a foundation with government grants.

New Speaker Directory

One of the most important phases of the Society's services to its members was set forth in the report of National Program Chairman H. D. Hall. He reviewed the speaker survey conducted by his committee, compiled in the form of a directory, and distributed to all Chapter Program Chairmen to aid them in planning effective meetings. Extensive material concerning technical films available to the Society is on hand at National Headquarters, and research on both speakers and films is being continued, he stated. Mr. Hall appealed to all Chapters to contribute to this work by sending their meeting notices to Headquarters.

Vice-President A. M. Sargent thanked the chairmen of these four committees which function under his direction as provided in the organization chart. He complimented all committee chairmen for their outstanding work in assisting him and President Briner in carrying out the ambitious program initiated by the Society. Commenting on their excellent co-operation in the preparation of the operations manual being processed by the Organization Progress Committee, he asked for their continued support.

Commends Committees

Second Vice-President W. B. Peirce then called upon the chairmen of the two committees falling within his province—Constitution and By-Laws, and Standards—praising them warmly for their outstanding work. In the absence of I. F. Holland, Ray H. Morris was appointed Chairman Pro Tem of the Constitution and By-Laws Committee. He reported on the processing and acceptance of the new Constitution and By-Laws recommended by the Organization Progress Committee. Completion of this major legislative revision is expected to simplify future operations of the former committee.

Reorganization of one of the fundamental functions of the Society has been undertaken by Standards Chairman W. H. Smila and his committee, their report indicated. Their survey of the Society

Featured in This Issue

membership resulted in an overwhelming demand for continued data sheet distribution. Plans have been completed for improving this service and making it self-sustaining. Chapters will be expected to actively co-operate in contacting local manufacturers expressing an interest in distributing data sheets to the members.

A definite program for the development of standards as a direct service to industry and to the Society is also under way. Assignments on this project, too, will be made to Chapters.

Standards Secretary Resigns

Frank W. Wilson, Handbook Editor, who has been serving simultaneously as Secretary of the Standards Committee, asked to be relieved of the latter office in order to devote his entire efforts to the accelerated Handbook program. Although reluctant to relinquish his services, the Committee is considering a new appointment augmented by qualified clerical assistance.

A healthy increase in membership was noted in Membership Chairman V. H. Ericson's report, recording 1330 applicants accepted since March 1. This figure was somewhat offset by the annual removals through death and other circumstances. Of the 18,205 members listed as of September 10, 1365 are serving with the Armed Forces. Two new Chapters have been chartered at Cedar Rapids, Iowa; and Aurora, Illinois.

A system has been devised at Headquarters for automatically promoting Junior members when age requirements can be satisfied. Co-operation of the Chapters is sought in investigating and approving these proposed advancements to Senior membership. During the period covered in Chairman Ericson's report, 467 Junior members were promoted.

The Committee will establish a membership quota for each Chapter and assist the local groups in attaining these quotas. Vice-President Orchard and Chairman Ericson will also devise a new formula governing the awarding of the Membership Trophy.

A recommendation, that Chapter Chairmen be responsible for notifying Headquarters of returning service men to be restored to active membership, was approved by the Board.

OPC Completes Assignment

Accomplishment of the objectives for which the Organization Progress Committee was created constitutes a major chapter in the Society's history. Chairman Ray H. Morris reported on the completion of the Committee's assignment of writing a new Constitution and By-Laws, and a procedures manual covering practically every situation arising in National and local administration. He paid special tribute to the groundwork laid by President Briner during his term as Chairman of this Committee, to the organizing ability and facilities placed at the Committee's disposal by First Vice-President A. M. Sargent, and to the counsel and guidance of Constitution and By-Laws Chairman I. F. Holland.

The new procedures manual will comprise the fourth and last division of the operations handbook in which are already incorporated the Constitution and By-Laws and organization charts. It is hoped that the manual will be ready for distribution when 1946 officers assume their duties next April.

A rising vote of thanks, in recognition of the efforts of the individual members of the Committee, was tendered by the Board, and the Committee was discharged.

Handbook Chairman E. W. Ernst reported that progress on the *Tool Engineers' Handbook* has exceeded all expectations. The work has reached a point where additional staff, office space and appropriation are required. Assignments for 62% of the editorial contents have been accepted by contributors, and a contract has been signed with the publisher. This automatically makes available to Editor Frank W. Wilson facilities now required in the physical development of the book.

The many inquiries and orders already received at National Headquarters assure a ready market for the manual, scheduled for publication late next year. Adequate funds, staff and office space were made available by the Board to bring this long-anticipated enterprise to swift conclusion.

Finances Reported

Reports of National Treasurer W. J. Frederick and Finance Chairman F. W. Eaton were analyzed by John F. Doyle, the Society's auditor. Mr. Doyle has revised the former calendar year accounting system to coincide with the Society's fiscal year of October 1 through September 30. A $24,000 increase in net worth for the nine-month period was noted in his comprehensive financial report.

Finance Chairman Eaton recommended that all revenue-producing activities be operated as separate businesses. His Committee's proposed budget, calling for appropriations totalling $99,600.00, was read and approved. Savings of $4500.00 in labor are contemplated to partially offset the first year's outlay of $7350.00 for installing and operating the new office mechanization system.

Processing of these reports and other business in an orderly and intelligent manner was facilitated by the Resolutions Committee, chairmanned by R. B. Douglas who proved himself an able parliamentarian. The Committee, composed of W. W. Young, John A. Lapham, E. W. Dickett and Mr. Douglas, screened the business scheduled on the agenda, making considered recommendations for its disposition.

"Directory" Approval

The publication of a National Directory, listing the entire membership, with address, business and biographical data, and a cross-listing by companies, will soon become a reality. This annual roster will enable members of the Society to contact each other, and to ascertain the member personnel of any given company. The proposed, cloth-bound book is expected to require 800-900 pages for listing the more than 18,000 members and the large section devoted to an advertising directory. This section will be alphabetically indexed by product and area. Publication is scheduled for next April when the new administration goes into office. Detroit Chapter Chairman Wayne Kay is in charge of the production.

Increased Operations

Reporting on the reorganization of National Headquarters, President Briner and First Vice-President Sargent pointed out that the tremendous increase in membership, and added activities, such as the publication of *The Tool Engineer* and the Handbook have made necessary large-scale methods of operation. Introduction of a mechanical system, employing the key punch process, will simplify accounting, addressing of *Tool Engineer* wrappers, dues notices and membership cards, and address changes.

Eventually cycle billing will replace the present year-end invoicing of dues which overloads the accounting department for several months of the year. Membership renewals, based on the date of the applicant's admission to the Society, will also assure a more constant source of income. Complete, accurate, up-to-the-minute records not now available can be furnished Chapters, duplicating the information contained in the books at National Headquarters.

Approval of plans for the largest exposition of machine tools and related equipment ever held by the Society was one of the Board's major decisions. Originally scheduled to be held in Cleveland last March, the postponed show will be presented on a larger scale April 8-12, 1946, commanding the entire facilities of the Cleveland Public Auditorium, as announced elsewhere in this issue. Technical sessions to be run concurrently, under the direction of the National Program Committee, will be open to members and show visitors.

Set Spring Meeting Date

The 1946 Annual Meeting will take place on April 7, following the assembling of the House of Delegates on the 6th, as prescribed in the new Constitution and By-Laws. Composed of representatives from the several Chapters, the latter body will elect a new Board of Directors.

After submitting his Semi-Annual report, Secretary A. M. Schmit read the resignation of Adrian L. Potter, Executive Secretary since 1942. It was accepted by the Board.

The recommendation of the Time and Place Committee, that the invitation to hold a national meeting in Pittsburgh be accepted for the October, 1946, Semi-Annual Meeting, was adopted by the Board. This invitation was originally extended for the October, 1945, meeting which was subsequently moved to Detroit to conform with current conditions.

Nominating Committee Elected

In compliance with provisions of the Constitution, President Briner named candidates for the Annual Nominating Committee, from whom the Board elected a committee of five. Those chosen were K. C. Jasper, G. J. Hawkey, F. W. Eaton, L. G. Singer, and Ray H. Morris whom the Committee selected as their Chairman. Announcing the results of the election, President Briner said, "It is hoped that our Annual Nominating Committee will make a real search for talent and pick only the best." The Committee will prepare a biographical and statistical ballot for processing nominations for Directors.

Only official social function of the meeting, which was primarily a business session, was the Saturday luncheon in the Fort Shelby's Ballroom, attended by approximately 65 members and their guests. After the meal was served, Robert Kuntz, Dayton Chapter Secretary, entertained the group with legerdermain, mystifying the audience with handkerchief, card and rope tricks.

Guest speaker William B. Stout, internationally-known Detroit inventor, urged tool engineers to be adventurous in designing. Asserting that radical designs will sell if they are better, he cited as examples automobiles and planes propelled from the rear. While 5000 years

ASTE To Stage Huge Exposition

Show Planned For Cleveland In April

THE MOST AMBITIOUS EXHIBITION of machine tools, cutting tools, and related production equipment and processes ever undertaken by ASTE will be presented in Cleveland, April 8-12, the Board of Directors has announced.

The 1946 ASTE Exposition will utilize the entire quarter-million square feet of floor space available in the Cleveland Public Auditorium, its annexes and underground areas. Second in a series of three postwar industrial shows to be held in Cleveland early next year, the Society's exhibition will follow ASM's in February and precede the American Foundrymen's in May.

C. V. Briner

This sequence of exhibits will give industry an opportunity to see, first, progress in metals and metallurgy; then, the ASTE display of new processes and equipment, evolved not only to cut costs and increase quality, but also to utilize the advances in metallurgy. Finally, new methods of casting, foundry equipment, molds and flasks, mold and core-making machinery, furnaces, and allied equipment to be exhibited at the Foundrymen's show will provide means of putting into effect the developments presented at the first two shows.

The Society's exposition is designed as an educational feature for all engaged in the field of production.

It is being planned to assemble as many as possible of the new techniques, machines, tools, materials for fabrication, drafting room supplies and tools, materials handling equipment, devices for determining costs of production and job evaluation, coolants and lubricants, gages, control devices of pneumatic, hydraulic electrical and electronic design.

Commenting on the purpose of the show, President C. V. Briner said:

"The added 'know how' acquired during the war years should be studied and reinterpreted in the light of peacetime requirements. We hope to accomplish this job with the exhibition and accompanying technical sessions in Cleveland. It's a tremendous job, and it will probably be impossible to completely cover the many new developments in production processes, equipment, machines and tools on which our new peacetime economy will be constructed. But no place in the country is large enough to house all such developments, and we will have to do our best in selecting those most significant to industry in general.

"America's peacetime industry will not follow the same pattern it did before the war. There is no such thing as reconversion. Reconversion means going back. There is no going back for us. Many plants may momentarily put out products similar to those we had before the war, turning them out in much the same manner.

"That, however, is only a temporary condition based on expediency to get production rolling faster and prevent high unemployment. Everybody in industry knows that not only our products but also our methods have to undergo a complete revamping. Our job as tool engineers is to see to it that this coming revolution in methods and equipment will make it possible to produce better goods at lower cost while industry is paying higher wages to the men who are producing the products.

"That's not an easy job," Mr. Briner admitted, "but it has to be done, if our national economy is to continue to expand and our standard of living to rise. This exhibition in Cleveland, we hope, will be a big help to us. We are inviting manufacturers to bring to us the things they have developed so that we can study them in the light of our needs."

Simultaneously, the National Program Committee will present important technical sessions in which eminent authorities will participate. They will bring to the Society's members and show visitors vital new information in the field of engineering for production.

The Society's Annual Meeting will precede the exposition, on April 7, following the convening of the House of Delegates on the 6th. This newly-constituted body will elect a Board of Directors to serve for the ensuing year.

Although more than 100,000 visitors are expected, plans are being perfected to insure a comfortable, uncrowded exposition. A new system has been worked out for the rapid registration of visitors, with adequate lounge, restaurant and other service facilities assured.

Complete floor plans of the exhibit space and reservation blanks are being mailed to all former exhibitors. Others interested in being represented at the show may secure copies from American Society of Tool Engineers, 1666 Penobscot Building, Detroit 26, Michigan.

(*Continued from Page 58*)

elapsed in advancing from chip stone hammers to cut hammers, he observed, more discoveries are now added to the store of human knowledge in a day than in any hundred years in the past.

Tracing the laborious efforts of the Curies in discovering radium, he stated that their findings were the beginning of our present knowledge of radio activity as demonstrated in radar, electronics and atom smashing. These and many other discoveries and inventions such as the steam engine and the locomotive were begun in small laboratories without elaborate equipment.

He prophesied that every industry would be revolutionized within the next five years, with new tooling, new assembly lines, new production systems and new light metals easy to fabricate. As new products are put into use, the standard of living will be automatically raised.

In closing Mr. Stout said, "People are more valuable as consumers than as producers. You can hire more laborers, but you can't hire more consumers. . . . Human problems can only be solved mechanically."

A rugged individualist, "Bill" Stout has pioneered in many fields. He constructed the first all-metal airplane and the first navy torpedo plane, the railplane, the theater seat that pushes back, and the rear-engined Scarab auto. He invented the tricycle landing gear and retractable wheels, the Stout trimotor; designed the Stout paneled houses and the Stout trailer, and operated one of the first commercial airlines, with flights between Detroit and Grand Rapids.

He takes as much pride in designing a toy for his grandson as in the new-type airplane wing with which he is experimenting.

At Dearborn, Michigan, he supervises the work of the three laboratories constituting the Research Division of Consolidated Vultee Aircraft Corporation. In his home workshop at Green Lake, he tinkers with projects "too wild for the Dearborn laboratory." He explains the simple equipment in his shop by saying that the more complicated tooling is the more involved the product is likely to be —that if tools are few, simplicity of design is the inevitable result.

Coming Meetings

CLEVELAND—Christmas Party and Dinner Dance, December 22 in the Rainbow Room, Carter Hotel.

DETROIT—Christmas Party (Stag), December 18 at the Latin Quarter, 6:30 P.M. Dinner, 7:30 P.M. Door prizes. Early reservations urged. Call PL. 7478.

ELMIRA—December 3 at Mark Twain Hotel. Speaker: A. A. Schwartz, Bell Aircraft Corp. Subject: "Tool Research."

NEW HAVEN—Christmas Meeting, December 13, Chi Psi House. Dinner, 6:30 P.M. Film: "Stainless Steel."

TOLEDO—December 12 at Toledo Yacht Club. Speaker: Fred R. Bokorney of Gisholt Machine Co. Subject: "Recent Developments in Balancing Machines."

TORONTO—Executives' Night, December 10, 6:30 P.M., at Malloney's Art Gallery. Speaker: Neil Petersen, President, Canadian Acme Screw and Gear, Ltd., and York Arsenals.

CHICAGO—December 3, Huyler's Restaurant. Dinner, 6:30 P.M. Speaker: W. J. Conley, Lincoln Electric Company. Subject: "Arc Welding of Jigs and Fixtures."

Tells How To Choose Tool Steels

Grand Rapids, Mich.—October meeting of Western Michigan Chapter, held on the 8th in the Ballroom of Rowe Hotel, was attended by approximately 40 members and guests.

Principal speaker of the evening was Leonard Grimshaw, Chief Metallurgist of Latrobe Electric Steel Company, Latrobe, Pennsylvania, who presented an instructive treatise on the selection and heat treatment of tool steels, and factors to be considered in reducing failures. Slides illustrated the speaker's remarks.

At the conclusion of Mr. Grimshaw's discussion, Ray P. Kells, Chief Service Engineer for the Latrobe company, conducted a question and answer period.

* * *

Speaker at the September 10th meeting was C. B. DeVlieg, owner of the DeVlieg Machine Company, Detroit, whose subject was "Hyper Milling." Many of the 68 members and guests in the audience took advantage of the opportunity to participate in the open discussion which followed his address.

ASTE National Officers listen attentively as a Director speaks from the floor at recent Semi-Annual Meeting of Board of Directors held in Fort Shelby Hotel, Detroit, October 12-13. Meeting was first to be conducted in accordance with new Constitution and By-Laws. Left to right: Secretary A. M. Schmit, Treasurer W. J. Frederick, 2nd V. P. W. B. Peirce, President C. V. Briner, 1st V. P. A. M. Sargent, 3rd V. P. Thomas P. Orchard, Asst. Secretary-Treasurer W. A. Dawson, and Resolutions Chairman R. B. Douglas.

ASTE Holds Twenty-Sixth National Meeting

Board of Directors Convenes At Detroit, October 12-13

Inventor "Bill" Stout, ASTE luncheon speaker, chats with (left to right) an unidentified guest, Gideon Kane, (Mr. Stout) George W. Wise, Joseph I. Karash, and E. M. Bertschi.

A group of luncheon guests. Left to right: Mrs. Harold Peiffer, Mrs. O. W. Winter, Miss Doris B. Pratt, Mrs. A. M. Sargent, Mrs. H. D. Hall, Mrs. A. M. Schmit, and Mrs. G. A. Hier.

Below, upper photo, Standards Chairman "Bill" Smila's yarn goes over. Left to right: Past President J. A. Siegel, 2nd V. P. W. B. Peirce, Mr. Smila, Pub. Rel. Committeeman B. C. Brosheer, Asst. Sec'y-Treas. W. A. Dawson, and Finance Chairman F. W. Eaton. Lower photo, C. V. Briner entertains "Bill"Stout and three National Officers with a Swedish dialect story. Left to right: W. B. Peirce, A. M. Sargent, Messrs. Stout and Briner, and T. P. Orchard.

Below, upper photo, Education Chrmn. O. W. Winter reads from report of Committee's activities. Left to right: B. C. Brosheer, Mr. Winter, T. P. Orchard, W. W. Young, and E. M. Bertschi. Lower photo, Charles Hasse (left) ASTE Office Manager, explains Headquarters addressing and mailing operations to (left to right) W. A. Dawson, H. R. Turner, Harry Carlberg, H. R. Shearer, J. A. Lapham, Al Mitchel, and E. Y. Seborg.

Above, H. R. Turner (right) arrives from Houston, Texas, and registers at Headquarters. Waiting to sign visitors book are (left to right) W. A. Dawson, J. A. Lapham, and A. J. Denis.

Above, head table at concluding luncheon. L. to R.: Ray H. Morris, A. M. Schmit, W. B. Peirce, W. B. Stout, guest speaker; C. V. Briner, A. M. Sargent, T. P. Orchard, and W. A. Dawson.

Above, left, delegates inspect stockroom at Headquarters. L. to R.: Howard Volz, H. D. Mozeen, A. J. Denis, E. W. DeBisschop, K. C. Jasper, and W. J. Gamble. In photo at right, busy "Andy" Rylander (right) Technical Editor of *The Tool Engineer* finds time to attend Semi-Annual Meeting. At left is Charles Hasse, ASTE Office Manager.

Directors and National Committee Chairmen answer roll call at opening of 13th Semi-Annual Meeting of ASTE Board of Directors. Left to right, 1st row: Directors A. J. Denis, F. W. Curtis and E. J. Berry; 2nd row: Director W. J. Gamble, Education Chmn. O. W. Winter, Director K. C. Jasper, Finance Chmn. Floyd W. Eaton, and Director J. A. Lapham; 3rd row: Directors Howard Volz, H. R. Shearer, L. J. Radermacher, H. D. Mozeen, and Editorial Chmn. G. J. Hawkey; 4th row: Membership Chmn. V. H. Ericson, B. C. Brosheer and Chmn. A. F. Denham of Public Relations Committee, Organization Progress Chmn. Ray H. Morris, and Director W. W. Young; 5th row: Finance Committeeman P. W. Brown, Peoria Chmn. E. M. Bertschi, Rochester Chmn. E. W. DeBisschop, Past Nat'l Sec'y E. V. Johnson, and Houston Chmn. H. R. Turner; 6th row: Handbook Editor F. W. Wilson, D. E. Roberts, the Society's attorney; G. W. Wise, Twin City Membership Chmn., and Al Mitchel, Syracuse Chapter. Last row: *ASTE News* Editor D. B. Pratt, Standards Chmn. W. A. Thomas and Chmn. C. G. Sampson, both of Windsor Chapter.

BUILDERS OF A.S.T.E.

Robert M. Lippard, President, 1935-36

By O. B. JONES, Society Historian

HERE IS BOB LIPPARD'S OWN STORY of what happened the year he led the Tool Engineers. During this year, the Society spread its first wings—one at Racine, and the other at Cleveland. The Society had been incubating up to this time and was just in the process of leaving its nest, either to fly or to perish. To go places it needed expert guidance. Lippard's experience in handling big things for his company gave him the needed poise. And speaking of flying, it seems to me that the highest flying creatures are the most helpless in infancy. If engineering societies are like that, look out for ASTE!

O. B. Jones

An eaglet or a wrenlet, pipping from its shell is wholly dependent for existence upon the good bug-hunting of its doting mother. If the bugs and drinks arrive on schedule, the birdling's naked helplessness soon disappears and the fully-feathered clutch is as capable of survival as are its parents.

Future Assured

The problems of survival were solved for the Society by the time Bob became its fourth President. From here on, the problem was how best to serve its members and industry. The sponsoring of the National Machine Tool Show in Cleveland was an excellent example of how it could serve both. But, let Bob tell you about it:

"At the time I took office as the fourth President of ASTE in April, 1935, the Society was largely a local organization confined to Detroit. The Society had definitely established itself and was beginning to realize that it was filling a real need and had great possibilities.

"The magazine, *The Tool Engineer*, was becoming established and people were beginning to use the words 'tool engineer' in connection with men engaged in what we now term the tool engineering profession.

"During the summer of 1935, the Society was extremely fortunate to be invited to sponsor a meeting of the Machine Tool Congress which was to be held in conjunction with the National Machine Tool Builders' Show in Cleveland from September 11 to September 21. This was the first recognition that ASTE had ever received from industry and was, I believe, the turning point in its history, when it emerged from a purely local organization to an international one.

Charters Lake Steamer

"With the impetus of this recognition and the fact that many members wanted to attend the Machine Tool Show and our Annual Meeting which was to be held concurrently in Cleveland, the *S.S. Greater Detroit* was chartered and a large group of our members, together with their friends, went to the Show. Stories about that trip from Detroit to Cleveland and back will always be told when the oldtimers of ASTE get together.

"Through the medium of its official publication, *The Tool Engineer*, the Society had a booth where literature relating ASTE's aims and functions was available, as well as application-for-membership blanks. It was a very pleasant surprise to see the keen interest shown by people from all over the country who had never heard of this organization.

Younger First Honorary Member

"Our Annual Meeting Dinner was held at the Hotel Statler, and the attendance was the largest that we had ever had for such a function. At this meeting, it was my great pleasure to award our first Honorary Membership to Professor John Younger of Ohio State University for his contribution toward the development of the Society among the colleges, particularly his own school. It seems particularly fitting after ten years that he should have been awarded that Honorary Membership at that time, as it certainly was a start in the direction of the sentiment expressed in the editorial, 'John Doe, T.E.,' which was written by President Briner for the September, 1945, *Tool Engineer*.

"At the Cleveland meeting, Past President W. H. Smila first spoke of the program for data sheets which ultimately developed and led toward the development of the Handbook. A. H. d'Arcambal, who later became President, also spoke at this meeting on the subject, 'Trend of the Development of Cutting Tools.'

Racine Organizes Chapter

"As a result of the publicity gained at the Machine Tool Show in Cleveland, our membership began to increase, and requests for the formation of Chapters began to come in from various parts of the country. The question of the formation of Chapters was given careful consideration, and in October of 1935, Racine Chapter, No. 2, was officially chartered.

R. H. Lippard

"I shall never forget the trip Al Sargent and I made to Racine to present the Charter to this newly-formed Chapter, and as I look back on it now, it certainly was a milestone in the history of our Society. Later, in December, I had the pleasure of chartering Chapter No. 3 at Cleveland. As my term of office closed, requests for information concerning the organizing of Chapters were being received from other cities.

"As I look back on some of the experiences we had during my term of office, I cannot help but mention the great amount of help I received from my right-hand man, Ford R. Lamb, who was First Vice-President at that time. I do not believe any of us will ever fully appreciate what he contributed to the Society, later as President and finally as our first Executive Secretary. His untimely death was a severe loss to all of us, both as Executive Secretary of the Society and as a personal friend to many of its members.

"I cannot help mentioning also the co-operation which I received from the Directors who were all located in Detroit. Whenever a job had to be done, they were always ready to do it. At that time the office of the Society was in a room which had been kindly donated to us by Al Sargent, our present First Vice-President. The room was in the basement of his engineering plant, and we used this for Directors' meetings, speakers' club meetings, and many other purposes which might or might not come within the scope of the Society.

"A Board of Directors' meeting was called without the least provocation, and frequently the Directors' wives were also drafted to help us get out the large mailings which we made, especially in connection with the boat ride to Cleveland. Many a night we were in session until long after the midnight hour.

Knudsen Guest Speaker

"A number of very interesting meetings were held during my term of office, one well-attended one in particular being when Mr. William H. Knudsen spoke. I also remember a meeting where Raymond Foulkrod of the Michigan Bell Telephone Company gave us an interesting talk on 'Engineering A Telephone Plant,' and another where Dr. W. A. Dean, Aluminum Company of America, lectured on 'Machining New Heat Treated Alloys.'

"Professor E. W. McFarland, Wayne University, gave a very interesting presentation of something that tool engineers have to know—'The Consumer Must Be Heard.' Mr. C. S. Kinnison, Hoskins Mfg. Company, spoke at one of the meetings on the 'History and Application of Electric Heat.' This field has surely expanded since then, proving the timeliness of this subject. E. H. Johnson, Packard Motor Car Company, gave us a talk at one of the meetings on 'Relationship of Processing to Cost,' which of course every tool engineer has to keep constantly in mind.

Constitution Outmoded

"During my term of office it was apparent that the Consitution and By-Laws of the Society were not adequate to take care of the growth which we knew would take place. After my retirement from the Presidency, I was appointed National Constitution and By-Laws Chairman, retaining this position until 1942. A study of our Constitution was made over a period of years, from 1936 to 1938, and at that time, with the co-operation of our present Constitution and By-Laws Chairman, Irwin F. Holland, we drew up a new Constitution and By-Laws which served the Society during its tremendous growth from that period until 1945.

"The growth of our organization has been phenomenal when you realize that today we have more than 18,000 members and 72 Chapters. Any small contribution which I may have made to the Society has paid dividends many times over for the wonderful benefits which industry and the country at large have obtained from the co-operative effort of the American Society of Tool Engineers."

Next month Mr. Jones will relate the highlights of Ford R. Lamb's term in office during 1936-37.

Educational Program Launches 1945 Design Courses

Philadelphia, Penna.—Marking the opening of the sixth season of Philadelphia Chapter's Tool Engineering courses at Spring Garden Institute, the September 20 Chapter meeting held in the school's auditorium, featured an outstanding educational program.

Dr. John J. Caton, founder and retired director of Chrysler Institute of Engineering, Detroit, the principal speaker, presented "Common Sense In Technical Engineering." The distinguished educator, who has spent forty years in teaching and practicing engineering, defined a pedagogue as "a person educated beyond his ability, who expounds too many opinions and too few facts."

Expressing an opinion that working for a degree made a better man, he said, "You fathers who say, 'My boy won't have to get it the way I did,' are wrong. You will ruin that boy! Let him work for it." Dr. Caton, himself, worked as an engineer on the Lehigh Railroad to earn his way through Lehigh University. He cited men prominent in industry who have reached the top in their respective fields without the aid of degrees, through perseverance in achieving their goals.

He described both undergraduate and post graduate courses at Chrysler Institute, comprising some fifty-seven engineering departments. Students who are absolute failures in some departments are often brilliant successes in others, he emphasized.

The speaker analyzed various types of engineers—the research engineer who reaches into the ether for his work, not knowing how he can use it after he has found it. Only one out of every 104½ engineers qualify for this work. The experimental engineer grasps at the research engineer's findings and develops means of utilizing them. Then comes the design engineer who, according to Dr. Caton, is temperamental, if he is a genius.

As attributes for success, he named knowledge, wisdom which transcends knowledge, and personality—the intangible quality which draws people to its possessor.

In closing, the speaker appealed to tool engineers for leadership in the world crisis. He pointed out that Christianity had gradually improved men's standards, and pleaded for all faiths and denominations to work together for the betterment of mankind.

Another guest speaker, Third Vice President Thomas P. Orchard, made a plea for more practical, formal education in tool engineering to relieve the burden industry has been carrying in this direction. He pointed out that vocational schools are drifting away from their original practical views in many cases, requiring college graduates in theoretical engineering as instructors, rather than experienced shop men. As a result their courses are not practical from industry's viewpoint.

He defined the average young man interested in a tool engineering education as one who, unable to attend college, was seeking effective industrial training to permit him to enter his chosen field of activity. It was his belief that shop work and tool designing in vocational schools should be prerequisite to college entrance for students wishing to study advanced tool engineering.

His own efforts in teaching tool designing began when several young men requested him to give them private instruction in this subject. Soon, a non-profit school of 75-100 students had developed. Classes were conducted once a week, augmented with homework equivalent to two or three class sessions.

Mr. Orchard emphasized that his experience indicated the necessity for individual instruction, his own classes being limited to a maximum of twelve students. He permitted students to capitalize on their previous training, each individual progressing according to his ability. Under this method of instruction, the average student was able to prepare himself professionally in about three twenty-week semesters.

The speaker recommended that practical courses such as this be offered by vocational schools and made prerequisite to entrance in colleges granting degrees in tool engineering courses.

In closing, he paid tribute to Education Chairman Otto W. Winter, who, in the face of earlier opposition from institutions of higher learning, has succeeded in winning co-operation in establishing courses in tool engineering.

During the Chapter Officers' dinner which preceded the meeting, Mr. Winter outlined the program of his committee in its efforts to foster tool engineering degree courses. He urged the same recognition of tool engineering as that accorded the profession of law and medicine.

Joseph B. Parks, President of Spring Garden Institute, spoke briefly on reducing production costs. He also mentioned the training program which Spring Garden is qualified to offer to veterans.

Since 1939 the Chapter has sponsored evening courses at the Institute, in Tool, Die, Jig and Fixture Design. In that year, a committee chairmanned by E. R. Glenn was authorized to organize such courses. The co-operation of Dean Howard W. Gross, a Chapter member, was secured, and by fall the first class in Die Design met with an enrollment of 26 and Chairman Glenn as instructor. Twenty men completed the course, and the following season the Chapter was requested to offer a course in Tool, Jig and Fixture Design. Over 200 students have been graduated from these classes, many of whom are now key men in industry. These graduates have also taken a keen interest in the work of the Chapter.

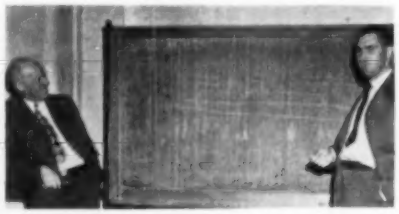
Present faculty consists of ASTE'ers John W. Noble, Charles M. Crook, Jr., and Foster M. Crayton. The Chapter awards annual prizes for outstanding work and invites all students to attend Chapter meetings. Co-operation of members, local industries and the Institute has been responsible for the success of these courses.

(Right) Howard W. Gross, Dean of Spring Garden Institute and First Vice-Chairman of Philadelphia Chapter, welcomes Chapter to the Institute on the occasion of the ASTE'ers first Annual Educational Program.

Seated on stage at Philadelphia Chapter's September 20 meeting in Spring Garden Institute are, left to right (front row): Secretary Warren W. Cady, Dr. John J. Caton, guest speaker and Honorary Member, ASTE; Third Vice-President Thomas P. Orchard, also a speaker; Constitution and By-Laws Committeeman Leonard S. Subber, Joseph B. Parks, President, Spring Garden Institute; and Chairman John W. Noble. Second row: Industrial Relations Chairman James F. Barnes, Standards Chairman Fred L. Creager, Education Committeeman Joseph Slobojan, Education Chairman Walter Candlin, Public Relations Chairman C. K. Burnside, Editorial Chairman John P. Clark, Jr.; Entertainment Chairman Edward R. Glenn, founder of ASTE Spring Garden courses in Tool Engineering; Membership Chairman Arthur R. Diamond, and former Education Chairman Charles Crook, Jr. Below, Philadelphia Chapter listens to Dr. John J. Caton discuss "Common Sense In Technical Engineering."

Wood Screw Early Product Of Automatic Machine

Rochester, N.Y.—Creighton Audette, Assistant Sales Manager of the Cone Automatic Machine Company, Windsor, Vermont, traced the origin and development of the automatic screw machine for Rochester Chapter when he addressed the members October 10 in the main auditorium of the Rochester Institute of Technology.



Creighton Audette, of the Cone Automatic Machine Company illustrates talk on "The History and Development of Automatics" with blackboard sketches at October 10 meeting of Rochester Chapter. Chairman Earle DeBisschop is interested spectator.

Early in the nineteenth century, the speaker related, an automatic machine for making wood screws was invented and built near Boston, Mass. Through the efforts of George Gridley, Frank Cone, and a fellow worker, and their interchange of ideas, the present bar and chucking automatic screw machine was developed, the speaker stated, describing some of the work turned out by present equipment.

Mr. Audette then screened a film prepared by the Cone company who recognized the need for a better understanding of the design and tooling of screw-making machinery. Three complete tooling setups for various parts produced on the automatic bar machine were shown, progressing through the tooling layout and the actual tooling and operation of the machine. The speaker displayed and discussed parts made on these machines.

Mr. Audette's eight years with his company, part of which has been spent in tool engineering, makes him eminently qualified to present the program which was thoroughly enjoyed by the audience of approximately 100.

During the evening Chairman Earle W. DeBisschop welcomed Bertram Pemberton, a Chapter member who has recently returned from service in the U.S. Marine Corps.

War Problems Accelerate Abrasive Progress

Cincinnati, Ohio—The October meeting of Cincinnati Chapter was held on the 8th at the Engineering Society Headquarters Building, with Fred L. Curtis, Manager of the Sales Engineering Department, Norton Company, Worcester, Massachusetts, as guest speaker.

His subject was "Recent Developments and Future Expectations in the Abrasive Industry." Mr. Curtis touched on the progress which has been made in such products as diamond wheels, Norflex wheels, porous type wheels, crusher dressing, and Norbide. New wartime developments were discussed, including the grinding of bullet-proof glass, tank prism blocks, and spark plug insulators.

Significance of the new grinding wheel markings was explained in the Norton film, "Grinding Wheels and Their Markings." This standard marking system, adopted by most of the abrasive industry, takes the mystery out of identifying grinding wheels, the film revealed.

Machine Tool Industry Should Be Flexible

Rockford, Ill.—H. E. Linsley, born and educated in England and a former flying officer of the Royal Air Force, gave a very constructive talk on "What Is Expected of the Machine Tool Industry," at Rockford Chapter's October 4 dinner meeting.

H. E. Linsley

In his address, the speaker stressed the importance of a strong, financially-sound and easily-expanded industry to provide for any future emergencies. He concluded his talk with a sound film, "Powerhouse of Aviation," showing the manufacture of the Wright Cyclone 18 Aircraft Engine.

Mr. Linsley, who came to the United States in 1927, was formerly associated with Wright Aeronautical Corporation, and now serves as Machine Tool Editor of *The Iron Age*. He is a Past Chairman of Northern New Jersey Chapter, ASTE.

BUY VICTORY BONDS

High Frequency Heating Economical, Curtis Says

Springfield, Mass.—At the opening meeting of the season, held September 10 in the Highland Hotel, Frank W. Curtis, Consulting Engineer, Induction Heating Corporation, New York City, discussed "High Frequency Heating Applied For Brazing and Hardening" before 80 members of Springfield Chapter.

F. W. Curtis

His talk, illustrated with colored motion pictures, pointed out that induction heating covers a broad field in metal working plants where metal parts require heating, for such operations as soldering, brazing, hardening, annealing and melting.

The speaker explained that three direct savings are made possible by using induction heating, namely: economical heating costs, especially where only localized surfaces are considered; comparatively large outputs, because of the fast rate at which metal can be heated; and reduction or elimination of spoilage, through automatic control and split-second timing. He indicated, too, that indirect economies, such as elimination of straightening and cleaning, often overshadowed the direct savings.

Mr. Curtis also explained two other considerations of importance in connection with induction heating—process planning and product design. In processing metal parts, often difficult operations will be simplified, and in other cases parts that present almost an impossibility by other means can now be processed by this method of heating.

A comprehensive outline of heating coil design, fixtures, special equipment and various handling devices was included in the lecture. The speaker exhibited parts treated by the induction method, as well as various types of heating coils.

The first Chairman of Springfield Chapter and a Past President of the Society, Mr. Curtis is now a National Director and member of the Handbook Committee.

Niagara District Has Grinding Session

Left: A group of Niagara District Tool Engineers smile as J. K. Davis, (right) Service Engineer, Bryant Chucking Grinder Company, Springfield, Vermont, tells a good story to introduce his address on "Better Tools For Internal Grinding" at recent meeting in the Leonard Hotel, St. Kitts, Ontario.

Shown in right hand photo: First Vice-Chairman Harry Gorth, Mr. Davis, Second Vice-Chairman W. L. Sandham, Chairman Henry Hendriks, and Mr. Lilly of Williams and Wilson, Toronto, who accompanied the speaker.

In the spirited discussion which followed the speaker's presentation, considerable information on grinding was contributed by the audience.

Industry And Technicians Study City's Future

San Diego, Calif.—Co-operating in a "Gala Technical Dinner Meeting," San Diego Chapter convened September 28 with all other technical societies, the Chamber of Commerce and the manufacturers of the city.

The session was conducted in the Roosevelt Junior High School Auditorium after dinner had been served in the school cafeteria. An estimated 300 people attended, including friends of members of the various organizations.

Chief purpose of the joint meeting was to bring to light local industrial opportunities for the manufacturer and the professional technician. The fact that San Diego was never a large producer of industrial goods in the pre-war era leaves it with a number of problems to be solved. Labor, trained technicians and factories are now available, though these resources are not yet completely developed.

Speakers for the evening were Bernard Gross, Director of Laboratories, Rohr Aircraft Corporation, who acted as Chairman and represented the technical and educational societies; Edmund T. Price, President of Solar Aircraft Company, representing industry, and Albert G. Reader, President of the San Diego Chamber of Commerce.

Mr. Gross opened the meeting by introducing the Chairman of each technical society represented. It was revealed that the San Diego Chapter of ASTE is the largest technical organization in the city. "The Technical Man in Business," Mr. Price's topic, gave a clear picture of how the trained technician fits into the manufacturer's scheme. He contended that the professional man was not only necessary to a company, but that the "trained man" is the company.

Industrial opportunities developing in San Diego were reviewed by Mr. Reader. His discussion was based on the Day and Zimmerman Report, the findings of an extensive research program recently conducted in this city. "Layoffs" in local plants were gradual, he indicated, beginning several months before final victory arrived and permitting absorption of labor into other industries.

In view of San Diego County's high agricultural resources, excellent climate, tourist facilities, prospects for a maintained navy base, and a very favorable outlook for light industries in many fields, the city is expecting a very low unemployment ratio and a high per capita income.

Each society, including ASTE, and many local manufacturers presented interesting educational displays. Success of the meeting indicates that similar affairs will be conducted in the future.

Carbide Tool Program Features Open Forum

New York City—Films on "Grinding and Applications of Carbide Tools" shown by Eugene Roth, Sales Manager, Eastern District, Vascoloy-Ramet Corporation, North Chicago, Illinois, opened the October 1 technical session of Greater New York Chapter, held in the Hotel New Yorker.

Eugene Roth

These were followed by an open forum discussion, with short talks by J. G. Kenney, Carbide Engineer, Brooklyn Navy Yard; W. R. Terry, Carbide Supervisor, Worthington Pump Company; E. J. Novak, Service Engineer and C. G. Padelford, Sales Engineer, Vascoloy-Ramet Corporation; William Heath, Tool Engineer, Wright Aeronautical Corporation; and W. Donnelly, Bendix Aviation Corporation.

Approximately 450 members and guests attended the dinner metting.

BUY VICTORY BONDS

"Shape Of Things To Come" Plastics Topic

Chicago, Ill.—"The Shape of Things to Come" was the subject of the talk presented by H. R. Husted, Technical Service Engineer for the Celanese Plastics Corporation, New York City, to 145 members and guests of Chicago Chapter at its October 1 meeting.

Mr. Husted is a qualified speaker on the subject of plastics, through his experience in the field. He received his engineering training at Case School of Applied Science, Cleveland, Ohio. In 1934, he entered the plastics field with the Stone Products of St. Claire, Michigan, and was associated with this company until 1938 when he assumed the position of superintendent at Columbus Plastics Products, Columbus, Ohio. Later he was in charge of plastics at Zenith Plastics, Cleveland.

In his talk Mr. Husted revealed some of the amazing developments made in the "synthetic fur field." He also included helpful hints to product designers, tool designers, and others, concerning materials, colors, molding techniques and mold design. The sound movie which supplemented his talk substantiated his statement that "you have to be crazy to be in plastics —at least it helps."

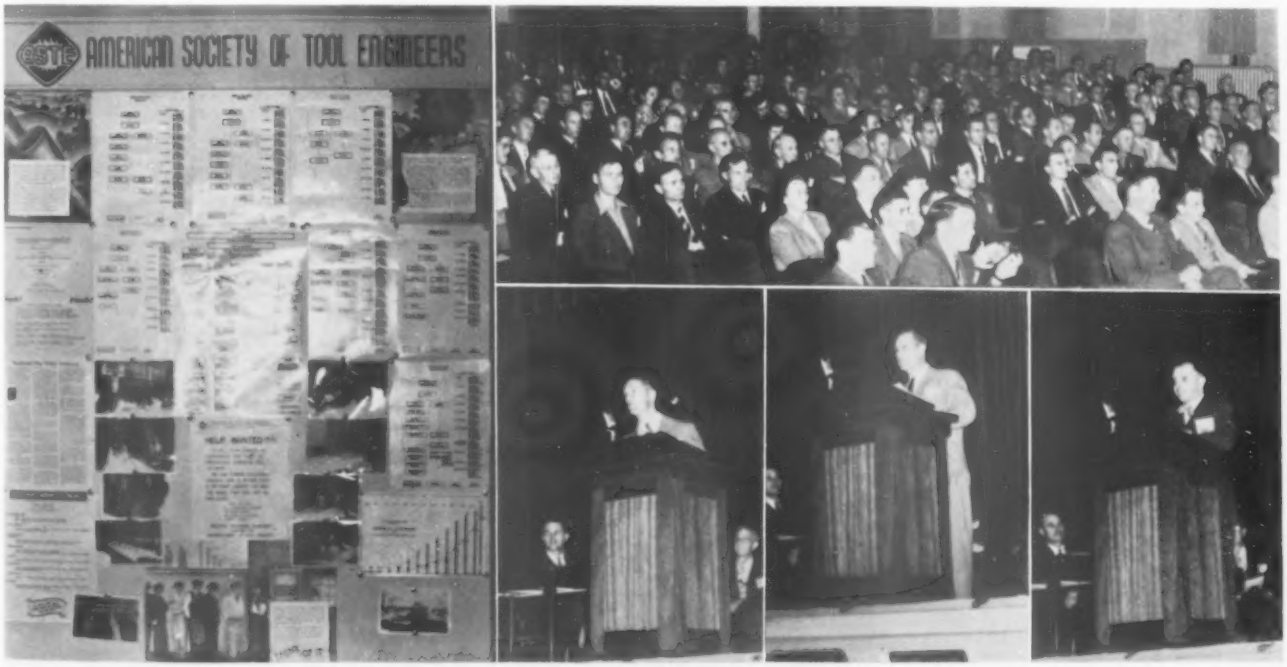
Although the meeting was officially adjourned at 9:30 P.M., Mr. Husted was kept busy answering questions from plastics enthusiasts who availed themselves of this opportunity to obtain first-hand information.

Curl Engaged In Research At Battelle Memorial

Columbus, Ohio—Henry M. Curl has been named to the staff of Batelle Memorial Institute and assigned to its division of production research.

Mr. Curl, a native of Columbus and a graduate M.E. of Ohio State University, was formerly associated with the Airplane Division of Curtiss-Wright Corporation in this city. He is affiliated with Columbus Chapter, ASTE.

Left: Exhibit prepared by San Diego Chapter for joint meeting of technical societies and industry to discuss city's business prospects. Upper right: Audience of 300 members of the participating organizations hear (below, left to right) Bernard Gross of Rohr Aircraft Corporation, representing the technical societies, Edmund T. Price of Solar Aircraft Company, speaking for industry, and Albert G. Reader, President of the Chamber of Commerce.



Executive Secretary Resigns

Detroit, Mich.—Adrian L. Potter, for three and a half years Executive Secretary of ASTE, resigned that position October 15. Mr. Potter was elected by the Board of Directors at the St. Louis convention in March, 1942, and assumed his duties in April of that year.

A. L. Potter

In all of the Society's subsequent activities, Executive Secretary Potter has had an important part, including the planning and execution of seven national meetings and the 1943 Machine and Tool Progress Exhibition. In speaking of the work done at the National Office, President Briner said, "The job it has done in the past is quite remarkable when the tremendously rapid growth of the Society is taken into account with its inevitable effect of repeatedly rendering obsolete the frequently revised and re-revised (in an effort to keep pace with ASTE growth) mechanics for distribution of needed information."

Fuss Describes Setups For Centerless Grinding

Fort Wayne, Ind.—Norman Fuss of the Cincinnati Milling Machine Company, Cincinnati, was the technical speaker when Fort Wayne Chapter met September 12 at the Chamber of Commerce Building.

In his lecture on "Centerless Grinding," Mr. Fuss reviewed the basic principles of the process, showing slides depicting fixture construction, stock removal and production on each operation. Many special operations, performed through proper work rest and fixtures designed to accomplish contour and step grinds, were also shown.

Keen interest was indicated in the pertinent questions asked by the audience at the conclusion of the presentation.

The coffee speaker, R. Nelson Snider, Principal of the South Side School, diverted the group with his analysis of "The Anatomy of Humor."

"Prosperity of America Is On Main Street"

Pittsburgh, Penna.—"The business and professional men, the engineers, and the God-fearing fathers and mothers of our nation have made America great, and they are going to keep America great." With this assertion, E. C. Brandt, Plant Manager, Curtiss-Wright Corporation, Propeller Division, Beaver, Pennsylvania, opened his address, "The Prosperity of America Is On Main Street," before Pittsburgh Chapter, September 14.

After pointing out that the defeat of our enemies was accomplished through the co-operation of these groups, he continued, "The reconversion and prosperity of America is the job of these same 'doers.' Our first prosperity will be achieved by the executive types—the engineers, bankers, industrialists—and our gainful occupational workers. Rehabilitation of all of our towns, cities, and manufacturing concerns must and will be done in the local communities.

"America has been wearing out rapidly during the terrible war. All its facilities —its public works, highways, bridges and homes—have been used 24 hours a day instead of 8 to 10 hours. But, deterioration is setting in. Rehabilitation is absolutely necessary. When we think of all the materials, labor, and efforts which will be required, our problems are staggering. We will give work to millions right in our own local communities, to say nothing of the many who will be employed on the public works projects now under consideration. . . .

"Show me a well-maintained town or city and I will show you a place where people want to work, live and bring up their families, build finer factories, schools, buildings, highways, airports, and railroads. We will raise finer families, better children, have the finer things of life, elevate our standing in society and maintain and increase America's greatness. Through this operation, we will become interested in our national and international affairs, because we have a great community. . . . If we have a poorly-conducted community, town, or city that gives an appearance of negligence, we cannot expect recognition in major problems.

"There was never a time in the history of America when local businessmen and organizations of every type have been called upon to play the important part which they must play now. I, for one, am going to give my very best to the community in which I live, and do the best I possibly can for the prosperity and happiness of America. Through this medium, the rest of the world can take an example from us and, with our help, create a finer, better, peaceful world.

"The city 'fathers' or the men who have made America great should see that our young men and women . . . devote their time to creative efforts instead of to some of the destructive forces rampant in our land today. . . . If we don't do these things, then the idle, destructive man will impose upon society the things that will destroy us, and the enemies within our ranks will soon take over. . . .

"Let us look at the front pages of our daily newspapers, reporting strike upon strike—men craving for greater gains from every angle, violating contracts, trusts, and bonds with each other. . . . If ever there was a time when our engineers should give these problems most serious thought, it is now. . . . The creative and inventive minds of men have made America great and those same minds must keep America great.

"Labor-Management is an absolute necessity. I am quite sure that all our engineering societies and the many men who design and create the tools with which we work and produce will be in there pitching in every way. We can thereby iron out these problems and all other post-war problems as we have done other things in America—that is, in a big way.

"This is one group that does not concern itself with the technocrats. Its inventive mind has produced great things for reducing costs and producing more and more of the finer things of life which the people who produce them want. They are educated to want them in our schools, homes, stores, advertisements and trade periodicals. They keep wanting them until they get them, thereby increasing the demand for their products and their labor.

"This is not all done in our large cities. It is done all over our nation. There are very few towns and cities that do not have their 'Main Street'—the prosperity of America is on Main Street and as Main Street goes, so goes America."

Early in the war, Mr. Brandt, a long-time member of Pittsburgh Chapter, was called to Detroit by WPB to help organize the aircraft program, later going to the Eliot Company in Jeannette, Pennsylvania, as Vice-President in Charge of Manufacturing.

An audience of 114 members heard Mr. Brandt's inspiring presentation at the opening meeting of the fall season, held in Fort Pitt Hotel.

Left: E. C. Brandt of Curtiss-Wright Corporation addresses September 14 meeting of Pittsburgh Chapter. Chairman C. E. J. Brickner is absorbed in Mr. Brandt's presentation, "Prosperity of America Is On Main Street." Right: Pittsburgh Chapter officers and committee chairmen.

During Semi-Annual Meeting in Detroit, Editorial Chairman G. J. Hawkey shows (left to right) Program Chairman H. D. Hall, Standards Chairman W. H. Smila and First Vice President A. M. Sarver original artist's drawing used to illustrate one of the "Pioneers of Mass Production" articles in THE *Tool Engineer*. Several of the panels in the background depict evolution of a technical article from manuscript to page proof, including original freehand drawings unique in technical publishing field. Posters on right and at end of table show stages in preparing a feature story for ASTE News. Included is four-months' file of correspondence, material used in research, typewritten story, photos, and galley and page proofs.

Large folder behind drawing held by Mr. Hawkey contains ten pounds of "paperwork" required to complete editorial contents of one issue. At right are fine-screen copper engravings necessary to effectively reproduce photographs on heavy enamel paper used in the Society's publication. Press sheets on table show printed 16-page layouts before folding, binding and trimming to make completed magazine.

FIVE PHASES OF BUILDING THE *EDITORIAL CONTENTS OF "THE TOOL ENGINEER"

TECHNICAL ARTICLES		A.S.T.E. NEWS
THE TECHNICAL EDITOR determines what is new and pertinent information for Tool Engineers and checks his list of writers.	**INCEPTION**	WE HAVE AN IDEA . . . we seek sources—by mail, telephone and telegram—in our files, from the public library, newspaper morgues, company libraries, and the columns of other publications.
HE SOLICITS CO-OPERATION from a qualified writer, "sells" him on the idea, and secures his assurance that the material will be prepared to meet the specified "deadline." The author writes the story and submits it.	**CO-OPERATION**	THIS IS WHERE the members can help. We need co-operation in securing material, photographs and information. Without this co-operation, the formula is worthless.
THE STORY IS EDITED, judged in the light of changing conditions in the tool engineering field, checked for accuracy, and submitted to the author for approval. A biography and photograph of the author and publication privileges are secured. Photographs, line drawings and charts form an essential part of the technical article. Without these, done effectively and intelligently, the story would not be complete nor understandable. The art director has accurate, freehand drawings (unique in the technical publishing field) made, retouches photos for emphasis on important elements and makes an attractive layout for the article, incorporating all these components. Halftones and line cuts are ordered, each of a size to effectively explain the text.	**PREPARATION**	THE MATERIAL SECURED is reviewed, correlated, developed into a story, edited, typewritten, re-edited and marked up with typesetting specifications. Lines are counted and reduced to column inches; photographs are cropped to improve the composition and marked for reduction or enlargement. Space required for photographs, captions, head and "air" is calculated and added to estimated text space. Photographs are sent to the engraver to be reproduced in fine-screen, copper halftones. Copy is set in type and assembled in galleys. Galley proofs are checked, corrected and O.K.'d.
FOLLOWING THE ARTIST'S LAYOUT, a pasteup is made of the text, proofs of engravings, captions and head. Subheads are inserted, allowing space for these extra lines. Pages are made up, checked, corrected, possibly edited to fit space or to conform with new technical developments. With determination of the editorial contents for the issue, the Table of Contents page and the front cover are prepared. The magazine is now "put to bed" and run through the presses. When the ink has dried, other pages are run on the back of each sheet, according to the printer's layout. Sheets are folded to page size, assembled and bound, then trimmed. The completed magazines are inserted in preaddressed envelopes and mailed.	**PRODUCTION**	A PASTEUP IS MADE for each page. If there are spaces to be filled, additional copy is written; if the text is too long, it is edited to fit the page. With this as a guide, the printer assembles the galleys into pages composed of type and halftones or line cuts. The printer submits page proofs which again are edited and corrected. After final proofs are O.K.'d, the index of Society News is compiled and set in type, and 16-page forms are so arranged that pages will be in proper sequence when the big press sheets are folded. Forms are locked, placed on the presses and the run made.
THROUGH THIS ENGINEERING sequence, mass production of "scientific knowledge in the field of Tool Engineering" is achieved, fulfilling the Society's function "to promote and through its members engage in research, writing, publishing and dissemination of such knowledge."	***Equals*** **COMPLETION**	ALL OF THESE STEPS are necessary to bring you your copy of THE TOOL ENGINEER, the outstanding publication in our field of activity—and YOUR MAGAZINE.

* In addition to the steps outlined for producing the editorial material, additional effort is involved in presenting the products of our advertisers who make it possible to bring you THE TOOL ENGINEER each month.

Chart detailing sequence of operations necessary to produce editorial contents of one issue of *The Tool Engineer* was part of exhibit displayed at Semi-Annual Meeting in Detroit, October 12-13.

Gauge And Tool Makers To Exhibit In London

London, Eng.—The Gauge and Tool Makers' Association will hold an important trade exhibition in New Hall, Vincent Square, London, S.W.1, January 7-19 inclusive, according to a recent announcement by the Association's Secretary, Gilbert T. Beach.

Approximately 100 member manufacturers will exhibit jigs, fixtures and special tools; press tools, molds and dies, and diamond tools and gauges. The trade show will cover an area of 20,000 square feet, with booths of uniform design. Visitors from overseas will be warmly welcomed.

Further information concerning the Association's first post-war show may be obtained directly from Mr. Beach at Standbrook House, Old Bond Street, London, W. 1, in care of the Association. He may be reached by telephone at Regent 3451/2.

College Training Develops Innate Qualities Cannot Create Them, Caton Says

South Bend, Ind.—Wisdom, personality and understanding, the things that make great men great, can be enhanced but not created by a college education, Dr. John J. Caton, former Director and founder of the Chrysler Institute of Engineering, Detroit, pointed out to the joint September meeting of the Engineers Club and South Bend Chapter, ASTE, held in the Indiana Club.

An engineering educator for 22 years, during which he has served as dean of engineering for two universities, Dr. Caton was thoroughly familiar with his subject, "Is A College Education Necessary?"

In his discussion the speaker reviewed the methods employed in the Chrysler Institute of Engineering which is a self-supporting school qualified to grant degrees in engineering science. The undergraduate school for Chrysler employees who wish to improve their education teaches any subject for which there is a substantial demand. Enrollment averages about 700, taught by a faculty of 92 Chrysler men. In the past fourteen years, the Institute has graduated 568 men, giving specialized training to thousands more.

The graduate school gives advanced training to graduates from accredited engineering schools. These students are given a two-year course in theory and practice during which they are rotated to some 50 or more engineering departments in an effort to discern the field for which they are best adapted.

Dr. Caton boldly asserted that no profession has more misfits, and that few engineers have writing or speaking ability. He further stated that, while most engineers know how to make a living, they do not know how to live. As evidence, he quoted figures indicating that 82% of the men trained for engineering never become engineers, because they lack the native ability to apply their knowledge.

A new system of education to be used for engineering training in England was next described. This program extends over a ten-year period, the first four years of which are devoted to a general liberal arts education. The next two years are employed in initiating the student into engineering and shop practices. If he is still inclined to become an engineer, the student concentrates on technical subjects during the last four years.

In stressing the utilization of inherent talents and abilities, Dr. Caton quoted examples of a number of Chrysler employees who improved their positions and aided the company by discovering their talents. He cited the case of a burly gate-watchman who, despite abnormally thick fingers, became a stenographer—subsequently, personal secretary to Walter P. Chrysler, and, upon the latter's death, one of the top executives of the corporation.

Paul Winkelmann, Chairman of the local ASTE Chapter, presided over the meeting which was attended by 105 members.

ASTE'ers at South Bend unite with the Engineers Club for their September meeting in the Indiana Club. In center of upper view are (left) Dr. John J. Caton, guest speaker, and Paul Winkelmann, South Bend Chapter Chairman, who presided over meeting.

98" Strip Mill Seen In Plant Tour

Cleveland, Ohio—An afternoon tour of the 98" Strip Mill Division of Republic Steel Corporation, on October 11, gave Cleveland Chapter members a view of operations in the widest and fastest strip mill in the country.

Almost a mile in length, the entire mill is automatically controlled from a few centrally-located control panels. It is also equipped throughout with electrical heating units.

The ASTE'ers marvelled at the speed with which billets were sent through the rolls, flattened to plate and sheet, then wound into coils and cut, without any halt in the progress of the material.

* * *

On September 28, the Chapter enjoyed a clambake and golf party at Sleepy Hollow Country Club, Brecksville. Prizes were awarded for high and low scores, and strolling musicians entertained while the clams, lobster and chicken were being served.

HAVE *YOU* MAILED YOUR A.S.T.E. DIRECTORY QUESTIONNAIRE?

Scientist Demonstrates "Black Light"

Detroit, Mich.—A discussion of radar and atomic energy was included in Dr. Luther Gable's address on "Black Light" presented by Detroit Chapter, October 11. A nationally-known radium physicist and electronics engineer, Dr. Gable is an authority on radio activity and electronic radiations.

Actual demonstrations with scientific equipment dramatically illustrated Dr. Gable's talk. Projected in a darkened area, the invisible ray of "black light" rendered luminous the objects on which it was directed.

While he admitted that the new developments in the field of radio-activity would have to be absorbed gradually without immediately displacing present industries, he predicted an early application in the "walkie-talkie" which will soon be popular with consumers.

A capacity audience of approximately 500 heard Dr. Gable's timely presentation.

Guests included President C. V. Briner who spoke briefly concerning the Society's activities.

* * *

In September Charles Winthrop Copp, a teacher of English for 21 years in Japanese Government schools, related his impressions of Japan and his experiences as a prisoner after the Japanese arrested him on suspicion of espionage.

A full football game was unreeled before the group in the film, "King Football."

Situations Wanted

ADMINISTRATIVE MANUFACTURING EXECUTIVE, Brown & Sharpe and B.M.E. graduate. Twenty years' experience as Plant Manager and Chief Engineer in automotive stamping and electrical appliance fields. Capable of taking complete charge of plant—engineering, production, quality control, time evaluation, processing, and equipment purchasing, including tools, dies, jigs and fixtures and designing of same. Salary open. Write Box O, American Society of Tool Engineers 1666 Penobscot Bldg., Detroit 26, Mich.

Reconversion Activities Planned

Atlanta, Ga.—Formulation of a program for reconversion of Chapter activities to conform with postwar changes in this area was undertaken September 5 at the first fall meeting of Atlanta Chapter in the Ansley Hotel.

Member Paul Felts spoke briefly, outlining the aims and problems of the Chapter. Invited guests included executives and tooling personnel from the leading manufacturers in this section, who expressed themselves as desiring to co-operate and wholeheartedly support the Chapter.

The resignation of Chairman Sydney Barnett, who is moving to Florida, was regretfully accepted. Vice-Chairman Charles Jenkins will assume the duties of this office for the remainder of the term.

A REMINDER—
Mail Your A.S.T.E.
Directory Questionnaire
TODAY!

Chicago Hears Magnesium Symposium

Approximately 200 members and guests attended the first fall meeting of Chicago Chapter held recently at Huyler's Restaurant. Session opened in the late afternoon with a display of magnesium sand, permanent mold and die castings, tubings and extrusions presented by The Dow Chemical Company, Revere Copper and Brass, Inc., and Hills-McCanna Company.

A novel feature of the evening was the "Guess the Weight Contest" to determine the combined weight of four metals—and a young lady! Best guesser was Fred Johnson who was awarded the $25 Victory Bond prize.

Technical speakers included Alfred B. Two, Technical Advisor, Revere Copper and Brass, Inc.; William R. Caple, Chicago Office, The Dow Chemical Company; and Dan W. Moll, Vice President and Treasurer, Hills-McCanna Company, who presented various phases of magnesium production and processing, illustrated with motion pictures.

Upper, photos left to right: Chicago Chapter members study and examine magnesium exhibits. Lower left: At speakers' table are William R. Caple, Alfred B. Two, Ray F. Erickson, newly-elected Chapter Secretary; Chapter Chairman Frank A. Armstrong, and Dan W. Moll. Lower right: Ray F. Erickson (third from right) tries to concentrate on weight guessing contest as Alfred B. Two (second from right) watches.

Make Sure That
You Will Be Listed
in the
A.S.T.E. DIRECTORY
SEND IN YOUR
QUESTIONNAIRE—

Explains Compressed Air Applications

Pittsburgh, Penna.—Guest speaker at the October 5 meeting of Pittsburgh Chapter was E. E. Hewitt, Chief Engineer of Westinghouse Airbrake Company, Wilmerding, Pennsylvania, who spoke on "Compressed Air," a source of power and a means of controlling power. The meeting, second to be turned over to a local industry, provided a most enjoyable evening.

Mr. Hewitt presented a history of the airbrake, starting with the original brake that George Westinghouse first used 76 years ago. By the use of slides, the speaker explained in detail each improvement that has been made. He pointed out that, while the present-day brake is seemingly quite complicated, operating principles have changed little. Mr. Hewitt had on display a standard freight car valve used in 1906, as well as the latest model which was perfected in 1933.

He also described other uses for compressed air, such as controlling the rate of piston movement, controlling sequential operations and interlocking control systems.

As an added attraction, the Entertainment Committee arranged to have the Westinghouse Airbrake band present. Comedians as well as musicians, these players are famous at portraying "The Little German Band."

The highly successful dinner meeting, held at the Fort Pitt Hotel, was attended by 126 members and their guests.

E. E. Hewitt, Chief Engineer, Westinghouse Airbrake Company, tells Pittsburgh Chapter of compressed air applications for controlling power.

Below, "The Little German Band" from Westinghouse Airbrake Company provides entertainment at October 5 meeting.

"Deep Drawing" and "Radar" Co-Featured

Los Angeles, Calif.—First speaker at the October 11 dinner meeting of Los Angeles Chapter was Harry Ehrich, Chief Engineer, Norris Stamping & Mfg. Company, whose subject was "Deep Drawing of Metals." He explained the reduction of wall thickness method and the reduction of diameter method, and gave a vivid description of tooling for the deep drawing of the 55, 75, and 105mm. shell casings for the Army and Navy. His talk was illustrated with cutaway specimens of deep drawing stamping.

Harry Ehrich (center), Norris Stamping & Mfg. Company, and Homer Tasker (right) of Gilfillan Bros. Inc., speak at October 11 meeting of Los Angeles Chapter. At left is Chairman Arthur D. Lewis.

Homer Tasker, Chief Engineer for Gilfillan Bros., Inc., then spoke on "Radar Landing Control," screening a recently-released sound film on the radar ground control approach, produced by the U.S. Army Air Corps. This film emphasized the equipment and personnel necessary to bring a plane in through an overcast, and the team work which is essential between the ground crew and the pilot.

Dinner was served to 222 members and guests by Scully's Cafe where the meeting was held.

Reviews 7000 Years Of Metal Working

Indianapolis, Ind.—J. R. G. "Bob" Harris, Research Development Manager of Resistance Welding, Ampco Metal, Inc., Milwaukee, addressed the Indianapolis Chapter dinner meeting held October 1 in the Lincoln Hotel.

Mr. Harris illustrated his talk, "Golden Horizon," with a technicolor film of the same title. The production was a story of metals, dating back 7,000 years and showing the discovery and early use of copper. The subsequent development of this metal, bronze and aluminum was also depicted.

The audience was entertained by a violinist and accordionist who played request numbers during dinner.

Deep Hole Drilling Described

Williamsport, Penna.—"Deep Hole or Rifle Drilling" featured the program presented by Williamsport Chapter at their October 8 meeting in Odd Fellows Hall.

The technical session was in charge of Fred Johnson of the W. F. and John Barnes Company, Rockford, Illinois. He discussed various methods of drilling deep holes and described several types of drills and drill heads. Mr. Johnson also presented the attending members with brochures further describing the subject of his discussion.

Following the lecture, a film furnished by the Barnes company was shown, illustrating some very interesting tooling used in the manufacture of an armor-piercing shell.

Oberg Analyzes Economic Plans

Schenectady, N.Y.—Erik Oberg, Editor of *Machinery*, addressed Schenectady Chapter, October 11, on the subject, "Voluntary Economic Methods Versus Compulsory Economic Systems."

Erik Oberg

In his presentation, Mr. Oberg used a somewhat new approach to the subject of our present methods compared with socialism and communism. The topic was dealt with not as a controversial matter, but rather as an inquiry into certain fundamental but often overlooked facts. His paper was not an apology for any so-called economic system, nor a defense of any system. It was rather an analysis such as one would apply to a mathematical problem.

The author of the paper did not make mere assertions, but marshalled well-known facts to prove his conclusions. He endeavored to start a train of thought somewhat different from that ordinarily pursued in economic thinking. Fundamentals often overlooked in discussing such vague subjects as the capitalistic system, the profit system, private versus public property, free enterprise, socialism and communism were pointed out by the speaker. These topics today are of prime importance to every man engaged in industrial work and activities, he emphasized.

BUY VICTORY BONDS

Contrasts Right And Wrong Methods Of Designing

Baltimore, Md.—"Proper and Improper Design of Tools and Dies" was the subject presented by Howard J. Stagg of Syracuse, New York, Sales Metallurgist for the Crucible Steel Company of America, at the October 3 dinner meeting of Baltimore Chapter in the Engineers Club.

H. J. Stagg

In his discussion, Mr. Stagg analyzed both good and poor designs for tools and dies. Specifying materials for use with each design, he indicated right and wrong selections of metals. Heat treatment of each of the tool steels was described in detail.

In addition to his affiliation with Syracuse Chapter, ASTE, Mr. Stagg is a member of the British Iron and Steel Institute and SAE, having served for a number of years on the iron and steel division of the latter organization's Standards Committee.

Charles W. Sylvester, Director of Vocational Training, Baltimore Department of Education, reviewed "Vocational Training For War Industries," stressing the necessity of continuing this training during the reconversion period.

Ninety-two members and their guests were served at dinner, attendance rising to 117 for the meeting.

Powdered Metals Versatile

Toledo, Ohio—Technical speaker for Toledo Chapter's October 10 meeting at the Toledo Yacht Club was George E. Platzer, Chief Engineer, Amplex Division, Chrysler Corporation, Detroit.

G. E. Platzer

Mr. Platzer, who has appeared before a number of ASTE Chapters, delivered his address on "Machine Parts Fabricated From Powdered Metals." Besides explaining the relatively simple fabrication of complicated machine parts, he discussed the wide range of densities of powdered metal, pointing to its use even as a filter material. A large display of production parts made from powdered metals supplemented his slide-illustrated talk.

C. P. Wu, graduate electrical engineer of the University of Nanking, China, who is now associated with Electric Auto-Lite Company in this city, spoke briefly concerning production methods in this country as compared with those in China. Mr. Wu is one of some one hundred Chinese engineers spending a year in this country studying American industrial methods.

A sound film, "Carbon—Black Treasure," described the manufacture and application of carbon furnace electrodes.

One hundred and ten members and guests attended the dinner meeting.

Hydraulics Lecture Opens Season

Newark, N.J.—Northern New Jersey Chapter opened its 1945 season with a dinner meeting September 11 at Hotel Robert Treat.

Rupert P. Esser, (center), of Gerotor May Corporation, Logansport, Indiana, was technical speaker for September 11 meeting of Northern New Jersey Chapter. At left is First Vice-Chairman John Webster, with Chairman Frank L. Delhagen on the right.

Rupert P. Esser, of the Gerotor May Corporation, Logansport, Indiana, conducted the technical session on "Hydraulics." Mr. Esser explained the details of hydraulic equipment, including valves, cylinders, oil and water, and methods of application, describing each part of the hydraulic system very thoroughly. Blackboard diagrams clearly illustrated the highlights of his address. In the ensuing discussion period, the speaker answered a number of questions from the floor.

The dinner attendance of 67 increased to approximately 225 for the meeting.

BUY VICTORY BONDS

SUPPORT

THE VICTORY LOAN

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Goldberg Demonstrates Tapping And Drilling

Flint, Mich.—High speed drilling and tapping to precision limits were expertly demonstrated to Flint Chapter when Herman Goldberg, Chief Engineer in Charge of Manufacturing and Design, R. G. Haskins Company, Chicago, addressed September 20 dinner meeting.

A popular Chapter speaker, Mr. Goldberg made his subject, "Taps, Tapping and Quick-Acting Fixtures for Drilling and Tapping Operations," intensely interesting by giving an actual demonstration on a drill press.

The hundred or more members and guests who attended the meeting in the main auditorium of General Motors Institute found the discussion very informative and educational.

A film, "Two Seconds From Cutting To Threshing," produced by International Harvester Company, showed the mechanics and action of a combine thresher.

During the meeting, John Taunt, a Chapter member, presented Chairman Michael Skunda with a solid walnut gavel and block. Mr. Taunt made the gavel as a gift to the Chapter.

ASTE'er John Taunt (left) presents Chairman Michael Skunda of Flint Chapter with a solid walnut gavel and block which he designed and made for the Chapter's use.

Herman Goldberg of R. G. Haskins Company, Chicago, recent speaker at Flint Chapter, illustrates his address, "Taps, Tapping and Quick-Acting Fixtures for Drilling and Tapping Operations," with exhibition on milling machine.

RFC Facilitates Sale Of Surplus Tools

Fort Wayne, Ind.—Col. Frank F. Fisher, Jr., of Chicago, Assistant Chief, Surplus Property Division, Reconstruction Finance Corporation, spoke on "The Disposition of Government-Owned Surplus Machine Tools" at October 10 dinner meeting of Fort Wayne Chapter.

F. F. Fisher, Jr.

More red tape has been cut in the disposal of this equipment than was ever thought possible, Col. Fisher stated. From an original, complicated set-up of forms, records, priorities and long drawn out waiting periods, the present streamlined procedure has evolved with a minimum of office and desk work. However, he continued, RFC is powerless to sell or dispose of any government-owned equipment until the Army or Navy procurement agencies have declared it surplus. In answer to questions, he gave explicit instructions for undertaking the purchase of surplus equipment.

Col. Fisher served in World War I with the 108th U.S. Engineers Corps. During World War II he was a commanding officer's staff member at the Air Corps Radar School in Boca Raton, Florida. At present he is in charge of sales affecting several million dollars worth of machine tools and equipment in the Chicago area.

Technical speakers of the evening were Leonard Grimshaw, Chief Metallurgist, and Ray P. Kells, Chief Service Engineer of the Latrobe Electric Steel Company, Latrobe, Penna. Mr. Grimshaw gave a well-illustrated talk on "Selection and Heat Treatment of Tool and Die Steels" in which he outlined the basic analysis of the better known alloy steels. He reviewed in an interesting manner the history of the development of alloys to meet specific requirements of the steel industry.

He made his talk of practical interest by selecting fifteen different tools and dies, illustrating most of them with lantern slides, and telling exactly how each should be heat treated. As the tools and dies chosen are all known by experience to give their best service if made from a particular grade of steel, the reason for each choice of steel was explained.

Mr. Kells drew upon his years of experience in the development of alloys and the newer molybdenum steels, in ably handling the subsequent question and discussion period.

Among guests present were J. M. Underwood, Director of Market Research; R. F. Frazure, District Manager; and J. E. Preas, Sales Engineer, all of the Latrobe company, and E. G. DeForest, local RFC Supervising Engineer.

Seventy-nine members and guests were served at the dinner preceding the meeting in the Chamber of Commerce Building. Attendance during the technical session increased to 103.

Pvt. William Olkowski of Detroit Chapter surveys fleet of army trucks being loaded with repair parts produced in machine shops he set up in Africa. Pvt. Olkowski was awarded the Legion of Merit for his achievement in building a production line to supply unprocurable parts desperately needed at the front.

Details Correct Use Of Twist Drills

Kansas City, Mo.—Sixty-seven members and visitors attended the October 3 dinner meeting of Kansas City Chapter to hear H. C. Hurt of The Cleveland Twist Drill Company.

A film showing the correct use of twist drills preceded his talk on the manufacture and application of these drills. The speaker answered many and varied questions pertinent to his subject in the subsequent discussion period.

Dr. Kimble, Vice President of The Aireon Corporation of this city, discussed "Electronics in Post War Work," giving a resume of the use of radar during the war and an insight into its future applications. Several other aspects of electronics were also included in his remarks.

The A.S.T.E. DIRECTORY Will Be Valuable To You—

Fill Out and Mail Your Questionnaire!

Wins Legion Of Merit For Ordnance Achievements
Olkowski Builds Production Line In African Mud

Canastill, Algeria—Machine shops set up and supervised by ASTE'er William S. Olkowski, in the mud of the African winter, proved such an important factor in the campaigns operated from this sector that, by command of General Eisenhower, Pvt. Olkowski was awarded the Legion of Merit and his organization cited as a unit.

His citation for the Legion of Merit reads:

"WILLIAM S. OLKOWSKI, 16090300, Technician Third Grade, Headquarters and Service Company, 1st Battalion, *** Ordnance Regiment, for exceptionally meritorious conduct in the performance of outstanding services. In connection with the setting up and organization of the machine shop sections of the *** Ordnance Regiment base shops, and in certain technical developmental work of manufacturing parts and equipment which were vitally needed, his skill and ingenuity proved invaluable. The results of his untiring efforts have been of inestimable value to the military services and in keeping with the highest traditions of the Army."

Relating the circumstances leading up to his assignment and its successful execution, Pvt. Olkowski said, "In the early stages of the war it was impossible, due to lack of shipping facilities, to procure tools, parts, and equipment urgently needed by front-line troops. I was requested to open a machine shop and to manufacture, improvise, and fabricate the various items that ordnance depots were unable to supply at that time.

"My first task was to find a shop to open. There being none, we built one from a scrap lumber pile, and installed the few machines then available. By raiding stock piles and salvage yards, we were able to begin production of the more vitally needed items such as motor vehicle parts, small arms and artillery parts, stove parts and, to some extent, surgical instruments. From wrecked trains and scuttled ships, we salvaged steel. Aluminum alloys were procured from sabotaged French planes and brass from fractured artillery shell cases.

"Working night and day designing, building and fabricating jigs and fixtures, dies and gages, production was made possible. Soon, I had the satisfaction of seeing a small stream of nuts, bolts, couplings, and so forth rolling off our production line.

"It seemed that man-made adversities were not enough, and we had the elements of nature to cope with. The African winter is a continuous downpour of rain. As our shops were more or less in the open, we were working in knee-deep mud. If it were not for the cheerfulness and perseverance of my buddies, I doubt if we could have accomplished as much in so short a time and successfully completed our assigned work. Through their efforts, we were soon able to enlarge our production scale to such an extent that thousands of items were being flown daily to supply depots and other points of need.

"Our shops had been functioning approximately one month when our government requisitioned a foundry and machine shop of which I was given charge. Then came the burden of converting a French factory over to American production methods. Metals had to be analyzed for comparison with American standard stocks. Conversion tables had to be made and production lines set up. Having an electric furnace, a ferrous and non-ferrous foundry, and a complete productive machine shop at my disposal, all the things heretofore impossible were made possible.

"I was soon able to devote most of my time to the designing and modifying of ordnance equipment. Foremost of these was the anti-aircraft gun sight which I designed, tested and proved in Africa. My first combat experience was when I installed thirty-two of these gunsights in the field during the Tunisian campaign. Naturally, I was gratified when these sights proved to be successful.

"After the fall of Tunis, I equipped a sub-chaser with this anti-aircraft gun sight and patrolled the Mediterranean during the months of May and June in 1943, giving instruction to Naval personnel. Tripoli and Malta were the most interesting of the places I visited.

"My efforts were more than repaid when my organization received a unit citation, and I was awarded the Legion of Merit, the presentation being made by Major-General Wilson.

"Now that the war has been drawn to a successful conclusion, and as I recall some of the scenes of devastation I have viewed in Africa, France, and Germany, I feel a deep sense of personal satisfaction in the thought that my activities may have contributed in a small measure to the victory and possibly saved untold American lives.

"It is my earnest wish to soon take my place in the ranks of the Tool Engineers through whose ingenuity a peaceful America was converted into the Arsenal of Democracy."

Pvt. Olkowski, before entering the service, was associated with Esco Engineering Company of Detroit.

Don't Forget to Mail Your A.S.T.E. Directory Questionnaire!

Clambake Highlights Twin States Outing

Upper left: Director Frank W. Curtis of Springfield, Mass., hopes he's pulled lucky number at clambake served to approximately 75 members and guests of Twin States Chapter. Occasion is Chapter's September 15 outing at Bellows Falls Country Club, Rockingham, Vermont.

Upper right: Appetites appeased with chicken and clams, Director Curtis and a group of Twin States members relax and enjoy after dinner smokes. Lower left: Reception committee hails new arrivals. Lower left: Tool Engineers vie with golfing irons in prize competition. Famous Green Mountains are seen in the distance.

Industry And Technicians Study City's Future

San Diego, Calif.—Co-operating in a "Gala Technical Dinner Meeting," San Diego Chapter convened September 28 with all other technical societies, the Chamber of Commerce and the manufacturers of the city.

The session was conducted in the Roosevelt Junior High School Auditorium after dinner had been served in the school cafeteria. An estimated 300 people attended, including friends of members of the various organizations.

Chief purpose of the joint meeting was to bring to light local industrial opportunities for the manufacturer and the professional technician. The fact that San Diego was never a large producer of industrial goods in the pre-war era leaves it with a number of problems to be solved. Labor, trained technicians and factories are now available, though these resources are not yet completely developed.

Speakers for the evening were Bernard Gross, Director of Laboratories, Rohr Aircraft Corporation, who acted as Chairman and represented the technical and educational societies; Edmund T. Price, President of Solar Aircraft Company, representing industry, and Albert G. Reader, President of the San Diego Chamber of Commerce.

Mr. Gross opened the meeting by introducing the Chairman of each technical society represented. It was revealed that the San Diego Chapter of ASTE is the largest technical organization in the city. "The Technical Man in Business," Mr. Price's topic, gave a clear picture of how the trained technician fits into the manufacturer's scheme. He contended that the professional man was not only necessary to a company, but that the "trained man" is the company.

Industrial opportunities developing in San Diego were reviewed by Mr. Reader. His discussion was based on the Day and Zimmerman Report, the findings of an extensive research program recently conducted in this city. "Layoffs" in local plants were gradual, he indicated, beginning several months before final victory arrived and permitting absorption of labor into other industries.

In view of San Diego County's high agricultural resources, excellent climate, tourist facilities, prospects for a maintained navy base, and a very favorable outlook for light industries in many fields, the city is expecting a very low unemployment ratio and a high per capita income.

Each society, including ASTE, and many local manufacturers presented interesting educational displays. Success of the meeting indicates that similar affairs will be conducted in the future.

Carbide Tool Program Features Open Forum

New York City—Films on "Grinding and Applications of Carbide Tools" shown by Eugene Roth, Sales Manager, Eastern District, Vascoloy-Ramet Corporation, North Chicago, Illinois, opened the October 1 technical session of Greater New York Chapter, held in the Hotel New Yorker.

Eugene Roth

These were followed by an open forum discussion, with short talks by J. G. Kenney, Carbide Engineer, Brooklyn Navy Yard; W. R. Terry, Carbide Supervisor, Worthington Pump Company; E. J. Novak, Service Engineer and C. G. Padelford, Sales Engineer, Vascoloy-Ramet Corporation; William Heath, Tool Engineer, Wright Aeronautical Corporation; and W. Donnelly, Bendix Aviation Corporation.

Approximately 450 members and guests attended the dinner metting.

BUY VICTORY BONDS

"Shape Of Things To Come" Plastics Topic

Chicago, Ill.—"The Shape of Things to Come" was the subject of the talk presented by H. R. Husted, Technical Service Engineer for the Celanese Plastics Corporation, New York City, to 145 members and guests of Chicago Chapter at its October 1 meeting.

Mr. Husted is a qualified speaker on the subject of plastics, through his experience in the field. He received his engineering training at Case School of Applied Science, Cleveland, Ohio. In 1934, he entered the plastics field with the Stone Products of St. Claire, Michigan, and was associated with this company until 1938 when he assumed the position of superintendent at Columbus Plastics Products, Columbus, Ohio. Later he was in charge of plastics at Zenith Plastics, Cleveland.

In his talk Mr. Husted revealed some of the amazing developments made in the "synthetic fur field." He also included helpful hints to product designers, tool designers, and others, concerning materials, colors, molding techniques and mold design. The sound movie which supplemented his talk substantiated his statement that "you have to be crazy to be in plastics —at least it helps."

Although the meeting was officially adjourned at 9:30 P.M., Mr. Husted was kept busy answering questions from plastics enthusiasts who availed themselves of this opportunity to obtain first-hand information.

Curl Engaged In Research At Battelle Memorial

Columbus, Ohio—Henry M. Curl has been named to the staff of Batelle Memorial Institute and assigned to its division of production research.

Mr. Curl, a native of Columbus and a graduate M.E. of Ohio State University, was formerly associated with the Airplane Division of Curtiss-Wright Corporation in this city. He is affiliated with Columbus Chapter, ASTE.

Left: Exhibit prepared by San Diego Chapter for joint meeting of technical societies and industry to discuss city's business prospects. Upper right: Audience of 300 members of the participating organizations hear (below, left to right) Bernard Gross of Rohr Aircraft Corporation, representing the technical societies, Edmund T. Price of Solar Aircraft Company, speaking for industry, and Albert G. Reader, President of the Chamber of Commerce.

Executive Secretary Resigns

Detroit, Mich.—Adrian L. Potter, for three and a half years Executive Secretary of ASTE, resigned that position October 15. Mr. Potter was elected by the Board of Directors at the St. Louis convention in March, 1942, and assumed his duties in April of that year.

A. L. Potter

In all of the Society's subsequent activities, Executive Secretary Potter has had an important part, including the planning and execution of seven national meetings and the 1943 Machine and Tool Progress Exhibition. In speaking of the work done at the National Office, President Briner said, "The job it has done in the past is quite remarkable when the tremendously rapid growth of the Society is taken into account with its inevitable effect of repeatedly rendering obsolete the frequently revised and re-revised (in an effort to keep pace with ASTE growth) mechanics for distribution of needed information."

Fuss Describes Setups For Centerless Grinding

Fort Wayne, Ind.—Norman Fuss of the Cincinnati Milling Machine Company, Cincinnati, was the technical speaker when Fort Wayne Chapter met September 12 at the Chamber of Commerce Building.

In his lecture on "Centerless Grinding," Mr. Fuss reviewed the basic principles of the process, showing slides depicting fixture construction, stock removal and production on each operation. Many special operations, performed through proper work rest and fixtures designed to accomplish contour and step grinds, were also shown.

Keen interest was indicated in the pertinent questions asked by the audience at the conclusion of the presentation.

The coffee speaker, R. Nelson Snider, Principal of the South Side School, diverted the group with his analysis of "The Anatomy of Humor."

BUY VICTORY BONDS

"Prosperity of America Is On Main Street"

Pittsburgh, Penna.—"The business and professional men, the engineers, and the God-fearing fathers and mothers of our nation have made America great, and they are going to keep America great." With this assertion, E. C. Brandt, Plant Manager, Curtiss-Wright Corporation, Propeller Division, Beaver, Pennsylvania, opened his address, "The Prosperity of America Is On Main Street," before Pittsburgh Chapter, September 14.

After pointing out that the defeat of our enemies was accomplished through the co-operation of these groups, he continued, "The reconversion and prosperity of America is the job of these same 'doers.' Our first prosperity will be achieved by the executive types—the engineers, bankers, industrialists—and our gainful occupational workers. Rehabilitation of all of our towns, cities, and manufacturing concerns must and will be done in the local communities.

"America has been wearing out rapidly during the terrible war. All its facilities—its public works, highways, bridges and homes—have been used 24 hours a day instead of 8 to 10 hours. But, deterioration is setting in. Rehabilitation is absolutely necessary. When we think of all the materials, labor, and efforts which will be required, our problems are staggering. We will give work to millions right in our own local communities, to say nothing of the many who will be employed on the public works projects now under consideration. . . .

"Show me a well-maintained town or city and I will show you a place where people want to work, live and bring up their families, build finer factories, schools, buildings, highways, airports, and railroads. We will raise finer families, better children, have the finer things of life, elevate our standing in society and maintain and increase America's greatness. Through this operation, we will become interested in our national and international affairs, because we have a great community. . . . If we have a poorly-conducted community, town, or city that gives an appearance of negligence, we cannot expect recognition in major problems.

"There was never a time in the history of America when local businessmen and organizations of every type have been called upon to play the important part which they must play now. I, for one, am going to give my very best to the community in which I live, and do the best I possibly can for the prosperity and happiness of America. Through this medium, the rest of the world can take an example from us and, with our help, create a finer, better, peaceful world.

"The city 'fathers' or the men who have made America great should see that our young men and women . . . devote their time to creative efforts instead of to some of the destructive forces rampant in our land today. . . . If we don't do these things, then the idle, destructive man will impose upon society the things that will destroy us, and the enemies within our ranks will soon take over. . . .

"Let us look at the front pages of our daily newspapers, reporting strike upon strike—men craving for greater gains from every angle, violating contracts, trusts, and bonds with each other. . . . If ever there was a time when our engineers should give these problems most serious thought, it is now. . . . The creative and inventive minds of men have made America great and those same minds must keep America great.

"Labor-Management is an absolute necessity. I am quite sure that all our engineering societies and the many men who design and create the tools with which we work and produce will be in there pitching in every way. We can thereby iron out these problems and all other post-war problems as we have done other things in America—that is, in a big way.

"This is one group that does not concern itself with the technocrats. Its inventive mind has produced great things for reducing costs and producing more and more of the finer things of life which the people who produce them want. They are educated to want them, in our schools, homes, stores, advertisements and trade periodicals. They keep wanting them until they get them, thereby increasing the demand for their products and their labor.

"This is not all done in our large cities. It is done all over our nation. There are very few towns and cities that do not have their 'Main Street'—the prosperity of America is on Main Street and as Main Street goes, so goes America."

Early in the war, Mr. Brandt, a long-time member of Pittsburgh Chapter, was called to Detroit by WPB to help organize the aircraft program, later going to the Eliot Company in Jeannette, Pennsylvania, as Vice-President in Charge of Manufacturing.

An audience of 114 members heard Mr. Brandt's inspiring presentation at the opening meeting of the fall season, held in Fort Pitt Hotel.

Left: E. C. Brandt of Curtiss-Wright Corporation addresses September 14 meeting of Pittsburgh Chapter. Chairman C. E. J. Brickner is absorbed in Mr. Brandt's presentation, "Prosperity of America Is On Main Street." Right: Pittsburgh Chapter officers and committee chairmen.

During Semi-Annual Meeting in Detroit, Editorial Chairman G. J. Hawkey shows (left to right) Program Chairman B. D. Hall, Standards Chairman W. H. Smila and First Vice President A. M. Sargent original artist's drawing used to illustrate one of the "Pioneers of Mass Production" articles in *The Tool Engineer*. Several of the panels in the background depict evolution of a technical article from manuscript to page proof, including original freehand drawings unique in technical publishing field. Posters on right and at end of table show stages in preparing a feature story for A.S.T.E. News. Included is four-months' file of correspondence, material used in research, typewritten story, photos, and galley and page proofs.

Large folder behind drawing held by Mr. Hawkey contains ten pounds of "paperwork" required to complete editorial contents of one issue. At right are fine-screen copper engravings necessary to effectively reproduce photographs on heavy enamel paper used in the Society's publication. Press sheets on table show printed 16-page layouts before folding, binding and trimming to make completed magazine.

FIVE PHASES OF BUILDING THE *EDITORIAL CONTENTS OF "THE TOOL ENGINEER"

TECHNICAL ARTICLES		A.S.T.E. NEWS
THE TECHNICAL EDITOR determines what is new and pertinent information for Tool Engineers and checks his list of writers.	**INCEPTION**	WE HAVE AN IDEA . . . we seek sources—by mail, telephone and telegram—in our files, from the public library, newspaper morgues, company libraries, and the columns of other publications.
+		
HE SOLICITS CO-OPERATION from a qualified writer, "sells" him on the idea, and secures his assurance that the material will be prepared to meet the specified "deadline." The author writes the story and submits it.	**CO-OPERATION**	THIS IS WHERE the members can help. We need co-operation in securing material, photographs and information. Without this co-operation, the formula is worthless.
THE STORY IS EDITED, judged in the light of changing conditions in the tool engineering field, checked for accuracy, and submitted to the author for approval. A biography and photograph of the author and publication privileges are secured. Photographs, line drawings and charts form an essential part of the technical article. Without these, done effectively and intelligently, the story would not be complete nor understandable. The art director has accurate, freehand drawings (unique in the technical publishing field) made, retouches photos for emphasis on important elements and makes an attractive layout for the article, incorporating all these components. Halftones and line cuts are ordered, each of a size to effectively explain the text.	**PREPARATION**	THE MATERIAL SECURED is reviewed, correlated, developed into a story, edited, typewritten, re-edited and marked up with typesetting specifications. Lines are counted and reduced to column inches; photographs are cropped to improve the composition and marked for reduction or enlargement. Space required for photographs, captions, head and "air" is calculated and added to estimated text space. Photographs are sent to the engraver to be reproduced in fine-screen, copper halftones. Copy is set in type and assembled in galleys. Galley proofs are checked, corrected and O.K.'d.
+		
FOLLOWING THE ARTIST'S LAYOUT, a pasteup is made of the text, proofs of engravings, captions and head. Subheads are inserted, allowing space for these extra lines. Pages are made up, checked, corrected, possibly edited to fit space or to conform with new technical developments. With determination of the editorial contents for the issue, the Table of Contents page and the front cover are prepared. The magazine is now "put to bed" and run through the presses. When the ink has dried, other pages are run on the back of each sheet, according to the printer's layout. Sheets are folded to page size, assembled and bound, then trimmed. The completed magazines are inserted in preaddressed envelopes and mailed.	**PRODUCTION**	A PASTEUP IS MADE for each page. If there are spaces to be filled, additional copy is written; if the text is too long, it is edited to fit the page. With this as a guide, the printer assembles the galleys into pages composed of type and halftones or line cuts. The printer submits page proofs which again are edited and corrected. After final proofs are O.K.'d, the index of Society News is compiled and set in type, and 16-page forms are so arranged that pages will be in proper sequence when the big press sheets are folded. Forms are locked, placed on the presses and the run made.
	Equals =	
THROUGH THIS ENGINEERING sequence, mass production of "scientific knowledge in the field of Tool Engineering" is achieved, fulfilling the Society's function "to promote and through its members engage in research, writing, publishing and dissemination of such knowledge."	**COMPLETION**	ALL OF THESE STEPS are necessary to bring you your copy of THE TOOL ENGINEER, the outstanding publication in our field of activity—and YOUR MAGAZINE.

* In addition to the steps outlined for producing the editorial material, additional effort is involved in presenting the products of our advertisers who make it possible to bring you THE TOOL ENGINEER each month.

Chart detailing sequence of operations necessary to produce editorial contents of one issue of *The Tool Engineer* was part of exhibit displayed at Semi-Annual Meeting in Detroit, October 12-13.

Gauge And Tool Makers To Exhibit In London

London, Eng.—The Gauge and Tool Makers' Association will hold an important trade exhibition in New Hall, Vincent Square, London, S.W.1, January 7-19 inclusive, according to a recent announcement by the Association's Secretary, Gilbert T. Beach.

Approximately 100 member manufacturers will exhibit jigs, fixtures and special tools; press tools, molds and dies, and diamond tools and gauges. The trade show will cover an area of 20,000 square feet, with booths of uniform design. Visitors from overseas will be warmly welcomed.

Further information concerning the Association's first post-war show may be obtained directly from Mr. Beach at Standbrook House, Old Bond Street, London, W. 1, in care of the Association. He may be reached by telephone at Regent 3451/2.

SUPPORT THE VICTORY LOAN BUY MORE BONDS

College Training Develops Innate Qualities Cannot Create Them, Caton Says

South Bend, Ind.—Wisdom, personality and understanding, the things that make great men great, can be enhanced but not created by a college education, Dr. John J. Caton, former Director and founder of the Chrysler Institute of Engineering, Detroit, pointed out to the joint September meeting of the Engineers Club and South Bend Chapter, ASTE, held in the Indiana Club.

An engineering educator for 22 years, during which he has served as dean of engineering for two universities, Dr. Caton was thoroughly familiar with his subject, "Is A College Education Necessary?"

In his discussion the speaker reviewed the methods employed in the Chrysler Institute of Engineering which is a self-supporting school qualified to grant degrees in engineering science. The undergraduate school for Chrysler employees who wish to improve their education teaches any subject for which there is a substantial demand. Enrollment averages about 700, taught by a faculty of 92 Chrysler men. In the past fourteen years, the Institute has graduated 568 men, giving specialized training to thousands more.

The graduate school gives advanced training to graduates from accredited engineering schools. These students are given a two-year course in theory and practice during which they are rotated to some 50 or more engineering departments in an effort to discern the field for which they are best adapted.

Dr. Caton boldly asserted that no profession has more misfits, and that few engineers have writing or speaking ability. He further stated that, while most engineers know how to make a living, they do not know how to live. As evidence, he quoted figures indicating that 82% of the men trained for engineering never become engineers, because they lack the native ability to apply their knowledge.

A new system of education to be used for engineering training in England was next described. This program extends over a ten-year period, the first four years of which are devoted to a general liberal arts education. The next two years are employed in initiating the student into engineering and shop practices. If he is still inclined to become an engineer, the student concentrates on technical subjects during the last four years.

In stressing the utilization of inherent talents and abilities, Dr. Caton quoted examples of a number of Chrysler employees who improved their positions and aided the company by discovering their talents. He cited the case of a burly gate-watchman who, despite abnormally thick fingers, became a stenographer—subsequently, personal secretary to Walter P. Chrysler, and, upon the latter's death, one of the top executives of the corporation.

Paul Winkelmann, Chairman of the local ASTE Chapter, presided over the meeting which was attended by 105 members.

ASTE'ers at South Bend unite with the Engineers Club for their September meeting in the Indiana Club. In center of upper view are (left) Dr. John J. Caton, guest speaker, and Paul Winkelmann, South Bend Chapter Chairman, who presided over meeting.

98" Strip Mill Seen In Plant Tour

Cleveland, Ohio—An afternoon tour of the 98" Strip Mill Division of Republic Steel Corporation, on October 11, gave Cleveland Chapter members a view of operations in the widest and fastest strip mill in the country.

Almost a mile in length, the entire mill is automatically controlled from a few centrally-located control panels. It is also equipped throughout with electrical heating units.

The ASTE'ers marvelled at the speed with which billets were sent through the rolls, flattened to plate and sheet, then wound into coils and cut, without any halt in the progress of the material.

* * *

On September 28, the Chapter enjoyed a clambake and golf party at Sleepy Hollow Country Club, Brecksville. Prizes were awarded for high and low scores, and strolling musicians entertained while the clams, lobster and chicken were being served.

HAVE *YOU* MAILED YOUR A.S.T.E. DIRECTORY QUESTIONNAIRE?

Scientist Demonstrates "Black Light"

Detroit, Mich.—A discussion of radar and atomic energy was included in Dr. Luther Gable's address on "Black Light" presented by Detroit Chapter, October 11. A nationally-known radium physicist and electronics engineer, Dr. Gable is an authority on radio activity and electronic radiations.

Actual demonstrations with scientific equipment dramatically illustrated Dr. Gable's talk. Projected in a darkened area, the invisible ray of "black light" rendered luminous the objects on which it was directed.

While he admitted that the new developments in the field of radio-activity would have to be absorbed gradually without immediately displacing present industries, he predicted an early application in the "walkie-talkie" which will soon be popular with consumers.

A capacity audience of approximately 500 heard Dr. Gable's timely presentation.

Guests included President C. V. Briner who spoke briefly concerning the Society's activities.

* * *

In September Charles Winthrop Copp, a teacher of English for 21 years in Japanese Government schools, related his impressions of Japan and his experiences as a prisoner after the Japanese arrested him on suspicion of espionage.

A full football game was unreeled before the group in the film, "King Football."

Situations Wanted

ADMINISTRATIVE MANUFACTURING EXECUTIVE, Brown & Sharpe and B.M.E. graduate. Twenty years' experience as Plant Manager and Chief Engineer in automotive stamping and electrical appliance fields. Capable of taking complete charge of plant—engineering, production, quality control, time evaluation, processing, and equipment purchasing, including tools, dies, jigs and fixtures and designing of same. Salary open. Write Box O, American Society of Tool Engineers 1666 Penobscot Bldg., Detroit 26, Mich.

Reconversion Activities Planned

Atlanta, Ga.—Formulation of a program for reconversion of Chapter activities to conform with postwar changes in this area was undertaken September 5 at the first fall meeting of Atlanta Chapter in the Ansley Hotel.

Member Paul Felts spoke briefly, outlining the aims and problems of the Chapter. Invited guests included executives and tooling personnel from the leading manufacturers in this section, who expressed themselves as desiring to co-operate and wholeheartedly support the Chapter.

The resignation of Chairman Sydney Barnett, who is moving to Florida, was regretfully accepted. Vice-Chairman Charles Jenkins will assume the duties of this office for the remainder of the term.

A REMINDER—
Mail Your A.S.T.E.
Directory Questionnaire
TODAY!

Chicago Hears Magnesium Symposium

Approximately 200 members and guests attended the first fall meeting of Chicago Chapter held recently at Huyler's Restaurant. Session opened in the late afternoon with a display of magnesium sand, permanent mold and die castings, tubings and extrusions presented by The Dow Chemical Company, Revere Copper and Brass, Inc., and Hills-McCanna Company.

A novel feature of the evening was the "Guess the Weight Contest" to determine the combined weight of four metals—and a young lady! Best guesser was Fred Johnson who was awarded the $25 Victory Bond prize.

Technical speakers included Alfred B. Two, Technical Advisor, Revere Copper and Brass, Inc.; William R. Caple, Chicago Office, The Dow Chemical Company; and Dan W. Moll, Vice President and Treasurer, Hills-McCanna Company, who presented various phases of magnesium production and processing, illustrated with motion pictures.

Upper, photos left to right: Chicago Chapter members study and examine magnesium exhibits. Lower left: At speakers' table are William R. Caple, Alfred B. Two, Ray F. Erickson, newly-elected Chapter Secretary; Chapter Chairman Frank A. Armstrong, and Dan W. Moll. Lower right: Ray F. Erickson (third from right) tries to concentrate on weight guessing contest as Alfred B. Two (second from right) watches.

Make Sure That
You Will Be Listed
in the
A.S.T.E. DIRECTORY
SEND IN YOUR
QUESTIONNAIRE—

Explains Compressed Air Applications

Pittsburgh, Penna.—Guest speaker at the October 5 meeting of Pittsburgh Chapter was E. E. Hewitt, Chief Engineer of Westinghouse Airbrake Company, Wilmerding, Pennsylvania, who spoke on "Compressed Air," a source of power and a means of controlling power. The meeting, second to be turned over to a local industry, provided a most enjoyable evening.

Mr. Hewitt presented a history of the airbrake, starting with the original brake that George Westinghouse first used 76 years ago. By the use of slides, the speaker explained in detail each improvement that has been made. He pointed out that, while the present-day brake is seemingly quite complicated, operating principles have changed little. Mr. Hewitt had on display a standard freight car valve used in 1906, as well as the latest model which was perfected in 1933.

He also described other uses for compressed air, such as controlling the rate of piston movement, controlling sequential operations and interlocking control systems.

As an added attraction, the Entertainment Committee arranged to have the Westinghouse Airbrake band present. Comedians as well as musicians, these players are famous at portraying "The Little German Band."

The highly successful dinner meeting, held at the Fort Pitt Hotel, was attended by 126 members and their guests.

E. E. Hewitt, Chief Engineer, Westinghouse Airbrake Company, tells Pittsburgh Chapter of compressed air applications for controlling power.

Below, "The Little German Band" from Westinghouse Airbrake Company provides entertainment at October 5 meeting.

"Deep Drawing" and "Radar" Co-Featured

Los Angeles, Calif.—First speaker at the October 11 dinner meeting of Los Angeles Chapter was Harry Ehrich, Chief Engineer, Norris Stamping & Mfg. Company, whose subject was "Deep Drawing of Metals." He explained the reduction of wall thickness method and the reduction of diameter method, and gave a vivid description of tooling for the deep drawing of the 55, 75, and 105mm. shell casings for the Army and Navy. His talk was illustrated with cutaway specimens of deep drawing stamping.

Harry Ehrich (center), Norris Stamping & Mfg. Company, and Homer Tasker (right) of Gilfillan Bros. Inc., speak at October 11 meeting of Los Angeles Chapter. At left is Chairman Arthur D. Lewis.

Homer Tasker, Chief Engineer for Gilfillan Bros., Inc., then spoke on "Radar Landing Control," screening a recently-released sound film on the radar ground control approach, produced by the U.S. Army Air Corps. This film emphasized the equipment and personnel necessary to bring a plane in through an overcast, and the team work which is essential between the ground crew and the pilot.

Dinner was served to 222 members and guests by Scully's Cafe where the meeting was held.

Reviews 7000 Years Of Metal Working

Indianapolis, Ind.—J. R. G. "Bob" Harris, Research Development Manager of Resistance Welding, Ampco Metal, Inc., Milwaukee, addressed the Indianapolis Chapter dinner meeting held October 1 in the Lincoln Hotel.

Mr. Harris illustrated his talk, "Golden Horizon," with a technicolor film of the same title. The production was a story of metals, dating back 7,000 years and showing the discovery and early use of copper. The subsequent development of this metal, bronze and aluminum was also depicted.

The audience was entertained by a violinist and accordionist who played request numbers during dinner.

Deep Hole Drilling Described

Williamsport, Penna.—"Deep Hole or Rifle Drilling" featured the program presented by Williamsport Chapter at their October 8 meeting in Odd Fellows Hall.

The technical session was in charge of Fred Johnson of the W. F. and John Barnes Company, Rockford, Illinois. He discussed various methods of drilling deep holes and described several types of drills and drill heads. Mr. Johnson also presented the attending members with brochures further describing the subject of his discussion.

Following the lecture, a film furnished by the Barnes company was shown, illustrating some very interesting tooling used in the manufacture of an armor-piercing shell.

Oberg Analyzes Economic Plans

Schenectady, N.Y.—Erik Oberg, Editor of *Machinery*, addressed Schenectady Chapter, October 11, on the subject "Voluntary Economic Methods Versus Compulsory Economic Systems."

Erik Oberg

In his presentation, Mr. Oberg used a somewhat new approach to the subject of our present methods compared with socialism and communism. The topic was dealt with not as a controversial matter, but rather as an inquiry into certain fundamental but often overlooked facts. His paper was not an apology for any so-called economic system, nor a defense of any system. It was rather an analysis such as one would apply to a mathematical problem.

The author of the paper did not make mere assertions, but marshalled well-known facts to prove his conclusions. He endeavored to start a train of thought somewhat different from that ordinarily pursued in economic thinking. Fundamentals often overlooked in discussing such vague subjects as the capitalistic system, the profit system, private versus public property, free enterprise, socialism and communism were pointed out by the speaker. These topics today are of prime importance to every man engaged in industrial work and activities, he emphasized.

BUY VICTORY BONDS

Contrasts Right And Wrong Methods Of Designing

Baltimore, Md.—"Proper and Improper Design of Tools and Dies" was the subject presented by Howard J. Stagg of Syracuse, New York, Sales Metallurgist for the Crucible Steel Company of America, at the October 3 dinner meeting of Baltimore Chapter in the Engineers Club.

H. J. Stagg

In his discussion, Mr. Stagg analyzed both good and poor designs for tools and dies. Specifying materials for use with each design, he indicated right and wrong selections of metals. Heat treatment of each of the tool steels was described in detail.

In addition to his affiliation with Syracuse Chapter, ASTE, Mr. Stagg is a member of the British Iron and Steel Institute and SAE, having served for a number of years on the iron and steel division of the latter organization's Standards Committee.

Charles W. Sylvester, Director of Vocational Training, Baltimore Department of Education, reviewed "Vocational Training For War Industries," stressing the necessity of continuing this training during the reconversion period.

Ninety-two members and their guests were served at dinner, attendance rising to 117 for the meeting.

Powdered Metals Versatile

Toledo, Ohio—Technical speaker for Toledo Chapter's October 10 meeting at the Toledo Yacht Club was George E. Platzer, Chief Engineer, Amplex Division, Chrysler Corporation, Detroit.

G. E. Platzer

Mr. Platzer, who has appeared before a number of ASTE Chapters, delivered his address on "Machine Parts Fabricated From Powdered Metals." Besides explaining the relatively simple fabrication of complicated machine parts, he discussed the wide range of densities of powdered metal, pointing to its use even as a filter material. A large display of production parts made from powdered metals supplemented his slide-illustrated talk.

C. P. Wu, graduate electrical engineer of the University of Nanking, China, who is now associated with Electric Auto-Lite Company in this city, spoke briefly concerning production methods in this country as compared with those in China. Mr. Wu is one of some one hundred Chinese engineers spending a year in this country studying American industrial methods.

A sound film, "Carbon—Black Treasure," described the manufacture and application of carbon furnace electrodes.

One hundred and ten members and guests attended the dinner meeting.

Hydraulics Lecture Opens Season

Newark, N.J.—Northern New Jersey Chapter opened its 1945 season with a dinner meeting September 11 at Hotel Robert Treat.

Rupert P. Esser, (center), of Gerotor May Corporation, Logansport, Indiana, was technical speaker for September 11 meeting of Northern New Jersey Chapter. At left is First Vice-Chairman John Webster, with Chairman Frank L. Delhagen on the right.

Rupert P. Esser, of the Gerotor May Corporation, Logansport, Indiana, conducted the technical session on "Hydraulics." Mr. Esser explained the details of hydraulic equipment, including valves, cylinders, oil and water, and methods of application, describing each part of the hydraulic system very thoroughly. Blackboard diagrams clearly illustrated the highlights of his address. In the ensuing discussion period, the speaker answered a number of questions from the floor.

The dinner attendance of 67 increased to approximately 225 for the meeting.

BUY VICTORY BONDS

SUPPORT

THE VICTORY LOAN

BUY VICTORY BONDS

Goldberg Demonstrates Tapping And Drilling

Flint, Mich.—High speed drilling and tapping to precision limits were expertly demonstrated to Flint Chapter when Herman Goldberg, Chief Engineer in Charge of Manufacturing and Design, R. G. Haskins Company, Chicago, addressed September 20 dinner meeting.

A popular Chapter speaker, Mr. Goldberg made his subject, "Taps, Tapping and Quick-Acting Fixtures for Drilling and Tapping Operations," intensely interesting by giving an actual demonstration on a drill press.

The hundred or more members and guests who attended the meeting in the main auditorium of General Motors Institute found the discussion very informative and educational.

A film, "Two Seconds From Cutting To Threshing," produced by International Harvester Company, showed the mechanics and action of a combine thresher.

During the meeting, John Taunt, a Chapter member, presented Chairman Michael Skunda with a solid walnut gavel and block. Mr. Taunt made the gavel as a gift to the Chapter.

ASTE'er John Taunt (left) presents Chairman Michael Skunda of Flint Chapter with a solid walnut gavel and block which he designed and made for the Chapter's use.

Herman Goldberg of R. G. Haskins Company, Chicago, recent speaker at Flint Chapter, illustrates his address, "Taps, Tapping and Quick-Acting Fixtures for Drilling and Tapping Operations," with exhibition on milling machine.

RFC Facilitates Sale Of Surplus Tools

Fort Wayne, Ind.—Col. Frank F. Fisher, Jr., of Chicago, Assistant Chief, Surplus Property Division, Reconstruction Finance Corporation, spoke on "The Disposition of Government-Owned Surplus Machine Tools" at October 10 dinner meeting of Fort Wayne Chapter.

F. F. Fisher, Jr.

More red tape has been cut in the disposal of this equipment than was ever thought possible, Col. Fisher stated. From an original, complicated set-up of forms, records, priorities and long drawn out waiting periods, the present streamlined procedure has evolved with a minimum of office and desk work. However, he continued, RFC is powerless to sell or dispose of any government-owned equipment until the Army or Navy procurement agencies have declared it surplus. In answer to questions, he gave explicit instructions for undertaking the purchase of surplus equipment.

Col. Fisher served in World War I with the 108th U.S. Engineers Corps. During World War II he was a commanding officer's staff member at the Air Corps Radar School in Boca Raton, Florida. At present he is in charge of sales affecting several million dollars worth of machine tools and equipment in the Chicago area.

Technical speakers of the evening were Leonard Grimshaw, Chief Metallurgist, and Ray P. Kells, Chief Service Engineer of the Latrobe Electric Steel Company, Latrobe, Penna. Mr. Grimshaw gave a well-illustrated talk on "Selection and Heat Treatment of Tool and Die Steels" in which he outlined the basic analysis of the better known alloy steels. He reviewed in an interesting manner the history of the development of alloys to meet specific requirements of the steel industry.

He made his talk of practical interest by selecting fifteen different tools and dies, illustrating most of them with lantern slides, and telling exactly how each should be heat treated. As the tools and dies chosen are all known by experience to give their best service if made from a particular grade of steel, the reason for each choice of steel was explained.

Mr. Kells drew upon his years of experience in the development of alloys and the newer molybdenum steels, in ably handling the subsequent question and discussion period.

Among guests present were J. M. Underwood, Director of Market Research; R. F. Frazure, District Manager; and J. E. Preas, Sales Engineer, all of the Latrobe company, and E. G. DeForest, local RFC Supervising Engineer.

Seventy-nine members and guests were served at the dinner preceding the meeting in the Chamber of Commerce Building. Attendance during the technical session increased to 103.

Pvt. William Olkowski of Detroit Chapter surveys fleet of army trucks being loaded with repair parts produced in machine shops he set up in Africa. Pvt. Olkowski was awarded the Legion of Merit for his achievement in building a production line to supply unprocurable parts desperately needed at the front.

Details Correct Use Of Twist Drills

Kansas City, Mo.—Sixty-seven members and visitors attended the October 3 dinner meeting of Kansas City Chapter to hear H. C. Hurt of The Cleveland Twist Drill Company.

A film showing the correct use of twist drills preceded his talk on the manufacture and application of these drills. The speaker answered many and varied questions pertinent to his subject in the subsequent discussion period.

Dr. Kimble, Vice President of The Aireon Corporation of this city, discussed "Electronics in Post War Work," giving a resume of the use of radar during the war and an insight into its future applications. Several other aspects of electronics were also included in his remarks.

The A.S.T.E. DIRECTORY Will Be Valuable To You—

Fill Out and Mail Your Questionnaire!

Wins Legion Of Merit For Ordnance Achievements
Olkowski Builds Production Line In African Mud

Canastill, Algeria—Machine shops set up and supervised by ASTE'er William S. Olkowski, in the mud of the African winter, proved such an important factor in the campaigns operated from this sector that, by command of General Eisenhower, Pvt. Olkowski was awarded the Legion of Merit and his organization cited as a unit.

His citation for the Legion of Merit reads:

"WILLIAM S. OLKOWSKI, 16090300, Technician Third Grade, Headquarters and Service Company, 1st Battalion, *** Ordnance Regiment, for exceptionally meritorious conduct in the performance of outstanding services. In connection with the setting up and organization of the machine shop sections of the *** Ordnance Regiment base shops, and in certain technical developmental work of manufacturing parts and equipment which were vitally needed, his skill and ingenuity proved invaluable. The results of his untiring efforts have been of inestimable value to the military services and in keeping with the highest traditions of the Army."

Relating the circumstances leading up to his assignment and its successful execution, Pvt. Olkowski said, "In the early stages of the war it was impossible, due to lack of shipping facilities, to procure tools, parts, and equipment urgently needed by front-line troops. I was requested to open a machine shop and to manufacture, improvise, and fabricate the various items that ordnance depots were unable to supply at that time.

"My first task was to find a shop to open. There being none, we built one from a scrap lumber pile, and installed the few machines then available. By raiding stock piles and salvage yards, we were able to begin production of the more vitally needed items such as motor vehicle parts, small arms and artillery parts, stove parts and, to some extent, surgical instruments. From wrecked trains and scuttled ships, we salvaged steel. Aluminum alloys were procured from sabotaged French planes and brass from fractured artillery shell cases.

"Working night and day designing, building and fabricating jigs and fixtures, dies and gages, production was made possible. Soon, I had the satisfaction of seeing a small stream of nuts, bolts, couplings, and so forth rolling off our production line.

"It seemed that man-made adversities were not enough, and we had the elements of nature to cope with. The African winter is a continuous downpour of rain. As our shops were more or less in the open, we were working in knee-deep mud. If it were not for the cheerfulness and perseverance of my buddies, I doubt if we could have accomplished as much in so short a time and successfully completed our assigned work. Through their efforts, we were soon able to enlarge our production scale to such an extent that thousands of items were being flown daily to supply depots and other points of need.

"Our shops had been functioning approximately one month when our government requisitioned a foundry and machine shop of which I was given charge. Then came the burden of converting a French factory over to American production methods. Metals had to be analyzed for comparison with American standard stocks. Conversion tables had to be made and production lines set up. Having an electric furnace, a ferrous and non-ferrous foundry, and a complete productive machine shop at my disposal, all the things heretofore impossible were made possible.

"I was soon able to devote most of my time to the designing and modifying of ordnance equipment. Foremost of these was the anti-aircraft gun sight which I designed, tested and proved in Africa. My first combat experience was when I installed thirty-two of these gunsights in the field during the Tunisian campaign. Naturally, I was gratified when these sights proved to be successful.

"After the fall of Tunis, I equipped a sub-chaser with this anti-aircraft gun sight and patrolled the Mediterranean during the months of May and June in 1943, giving instruction to Naval personnel. Tripoli and Malta were the most interesting of the places I visited.

"My efforts were more than repaid when my organization received a unit citation, and I was awarded the Legion of Merit, the presentation being made by Major-General Wilson.

"Now that the war has been drawn to a successful conclusion, and as I recall some of the scenes of devastation I have viewed in Africa, France, and Germany, I feel a deep sense of personal satisfaction in the thought that my activities may have contributed in a small measure to the victory and possibly saved untold American lives.

"It is my earnest wish to soon take my place in the ranks of the Tool Engineers through whose ingenuity a peaceful America was converted into the Arsenal of Democracy."

Pvt. Olkowski, before entering the service, was associated with Esco Engineering Company of Detroit.

Don't Forget to Mail Your A.S.T.E. Directory Questionnaire!

Clambake Highlights Twin States Outing

Upper left: Director Frank W. Curtis of Springfield, Mass., hopes he's pulled lucky number at clambake served to approximately 75 members and guests of Twin States Chapter. Occasion is Chapter's September 15 outing at Bellows Falls Country Club, Rockingham, Vermont.

Upper right: Appetites appeased with chicken and clams, Director Curtis and a group of Twin States members relax and enjoy after dinner smokes. Lower left: Reception committee hails new arrivals. Lower left: Tool Engineers vie with golfing irons in prize competition. Famous Green Mountains are seen in the distance.

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Extensive Checking Attachment

When checking many parts for accuracy, concentricity and trueness in respect to a definite base, the operation may be rather difficult unless special devices are at hand. This is especially true where small bores and shoulders are involved. It happens, quite frequently, that various surfaces must be indicated which are very difficult to reach when the standard dial indicator is used in connection with the vernier height gage.

To facilitate such checking, a very practical and useful attachment was designed and put into use. It was found to possess wide possibilities in overcoming the difficulties outlined above. As shown in the photographs, the device consists of a Model A6Q Federal dial indicator, attached to a steel support. The support is held to the height gage beam by a small stamping screw, with the indicator held secure, in the support, by a small headless set screw, which permits adjusting the indicator to any desired position.

Referring to the drawing, the various details are numbered as follows: (1) the indicator, (2) the steel support, (3) the headless set screw, (4) the clamping screw, (5) 5/16" O.D. steel tubing approximately 6½" long. One end of this tube is fastened to the steel support and held in place by the set screw (6). The outer end is fitted with a No. 734 Brown & Sharpe Universal Attachment (7).

Fig. B shows a sectional view of the inside of the steel tube. Detail (8) represents a section of 1/16" drill rod running through the center of the tube and from the connection between the indicator and the Brown & Sharpe attachment. Located in the center of the tube, and ½" in from each end, are three brass bushings. These bushings (Det. 9) are pressed into the tube.

The bore in these bushings is about .004" to .006" larger than the diameter of the connecting rod. Note (Det. 10) that the bushing is countersunk 60°, thus permitting the connecting rod to actuate back and forth on three very short surfaces. This is done to reduce frictional losses.

Fig. C shows the details of the steel support. Attention is directed to Det. 11, which shows the manner in which the block is slotted. Det. 12 shows the slot which is machined to fit the height gage B. This should be a good sliding fit. Fig. D shows the clamping screw, and Fig. E shows the small gib which is inserted between the bottom of the clamping screw and the top surface of the height gage B.

D. E. McDonald
Northern New Jersey Chapter, A.S.T.E.

Statement of Ownership

STATEMENT of the Ownership, Management, Circulation, etc., required by the Acts of Congress of August 24, 1912, and March 3, 1933, of The Tool Engineer, published monthly at Detroit, Michigan, for October 1, 1945.
State of Michigan, County of Wayne——ss.

Before me, a notary in and for the State and County aforesaid, personally appeared Robert B. Powers, who, having been duly sworn according to law, deposes and says that he is the Executive Editor and Business Manager of The Tool Engineer and that the following is, to the best of his knowledge and belief, a true statment of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich. Editor Robert B. Powers, 550 W. Lafayette Blvd., Detroit 26, Mich. Managing Editor, None. Business Manager, Robert B. Powers, 550 W. Lafayette Blvd., Detroit 26, Mich.

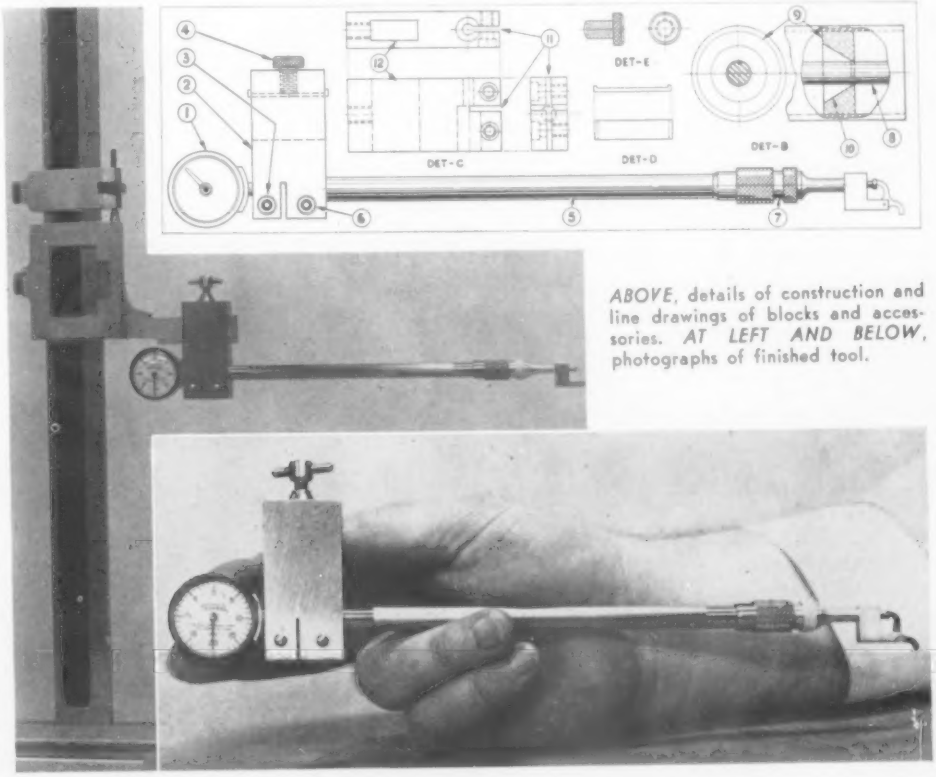
2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) American Society of Tool Engineers, Detroit, Michigan; Mr. C. V. Briner, University Heights, Ohio; Mr. A. M. Schmit, Toledo, Ohio; Mr. A. M. Sargent, Detroit, Michigan; Mr. W. J. Frederick, Cincinnati, Ohio; Mr. W. B. Peirce, Mt. Lebanon, Pittsburgh, Pa.; Mr. W. A. Dawson, Hamilton, Ontario, Canada; Mr. F. P. Orchard, New York, N. Y.; Mr. William W. Young, Winchester, Mass. Mr. Frank W. Curtis, Springfield, Mass.; Mr. Edward J. Berry, Providence, R. I.; Mr. Herbert D. Mozeen, Syracuse, N. Y.; Mr. Ernest M. Seifert, Washington, D. C.; Mr. Hallet D. Jones, Waynesboro, Pa.; Mr. Wm. J. Gamble, Buffalo, N. Y.; Mr. Howard Volz, Columbus, Ohio; Mr. H. E. Goodfellow, Grand Rapids, Michigan; Mr. H. R. Shearer, Indianapolis, Ind.; Mr. F. Martindell, Western Springs, Ill.; Mr. L. J. Radermacher, Blaks Corners, Wis.; Mr. K. C. Jasper, Lonisville, Ky.; Mr. John A. Lapham, Fort Worth, Texas; Mr. Arthur J. Denis, Hollywood, Calif.; Mr. W. C. Fields, Seattle, Wash. Mr. R. B. Douglas, Westmount, Quebec, Canada; Mr. D. D. Burnside, Detroit, Michigan.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is—(This information is required from daily publications only.)

Signature of editor, publisher, business manager, or owner. Robert B. Powers. Sworn to and subscribed before me this 15th day of October, 1945. Doris B. Pratt. My commission expires May 25, 1948.



ABOVE, details of construction and line drawings of blocks and accessories. *AT LEFT AND BELOW*, photographs of finished tool.

North East West South in Industry

ADOLPH G. HOCHBAUM has been made managing director for exports to U.S.S.R. and general sales representative for Central and Eastern European countries for the Baldwin Locomotive Works, according to Ralph Kelly, Baldwin president. Mr. Hochbaum, who is a graduate of University of Prague, Czechoslovakia, is fully acquainted with European conditions. He has been with Baldwin since 1939, handling various products for Russia, and the appointment is in line with the company's expansion in the international sales and service program.

HARTLEY W. WHITMORE has been appointed chief engineer of the Deepfreize Div'n of Motor Products Corp'n, No. Chicago. A graduate of Wisconsin U., Mr. Whitmore has had extensive experience in refrigeration and assumes full responsibility for continued development of Deepfreize home units and industrial sub-zero Chilling Machines.

As announced by Dan S. Hungerford, president, **AIRCRAFT PARTS DEVELOPMENT CORPORATION,** Summit, N.J., is moving to its new laboratory building in Murray Hill, N.J. Coincidentally, the organization is changing its name to Hungerford Research Corporation. The action is in line with broadening activity in product and process development in all fields of industry; however, specialization will continue in the application of powder metals and plastics to mechanical and electrical products.

WALTER C. SIMPSON has been appointed Sales Manager of Lukenweld, Inc., a subsidiary of Lukens Steel Company, according to announcement by J. Frederic Weise, vice president in charge of sales. Mr. Simpson, who is a graduate in metallurgical engineering from Lehigh U., has been with the Lukens organization since 1934. During that time he has served the company as research engineer and metallurgist, and in sales development.

J. M. SCHLENDORF, previously manager of sales, has been appointed vice president in charge of sales for Republic Steel Corporation. He succeeds **N. J. CLARKE,** who has been stepped up to senior vice president. The appointments were announced by T. M. Girdler, board chairman, and C. M. White, president, following the recent directors' meeting of the corporation. Both men are prominent in industry and have been with Republic Steel since the corporation was formed.

F. W. ELYA has been made district manager of the newly created Northeastern District by Norton Company, Worcester, Mass. With the exception of Connecticut, the territory comprises the New England states and New York with the exception of the southern counties. Mr. Elya has been with Norton Company for 3 years, the past 20 as abrasive engineer for Western New York, with H.Q. in Rochester. R. J. Forkey, Norton abrasive engineer in the Syracuse district, will take over the western New York territory and Robert Cushman, from Norton's Worcester office, will cover Mr. Forkey's former territory.

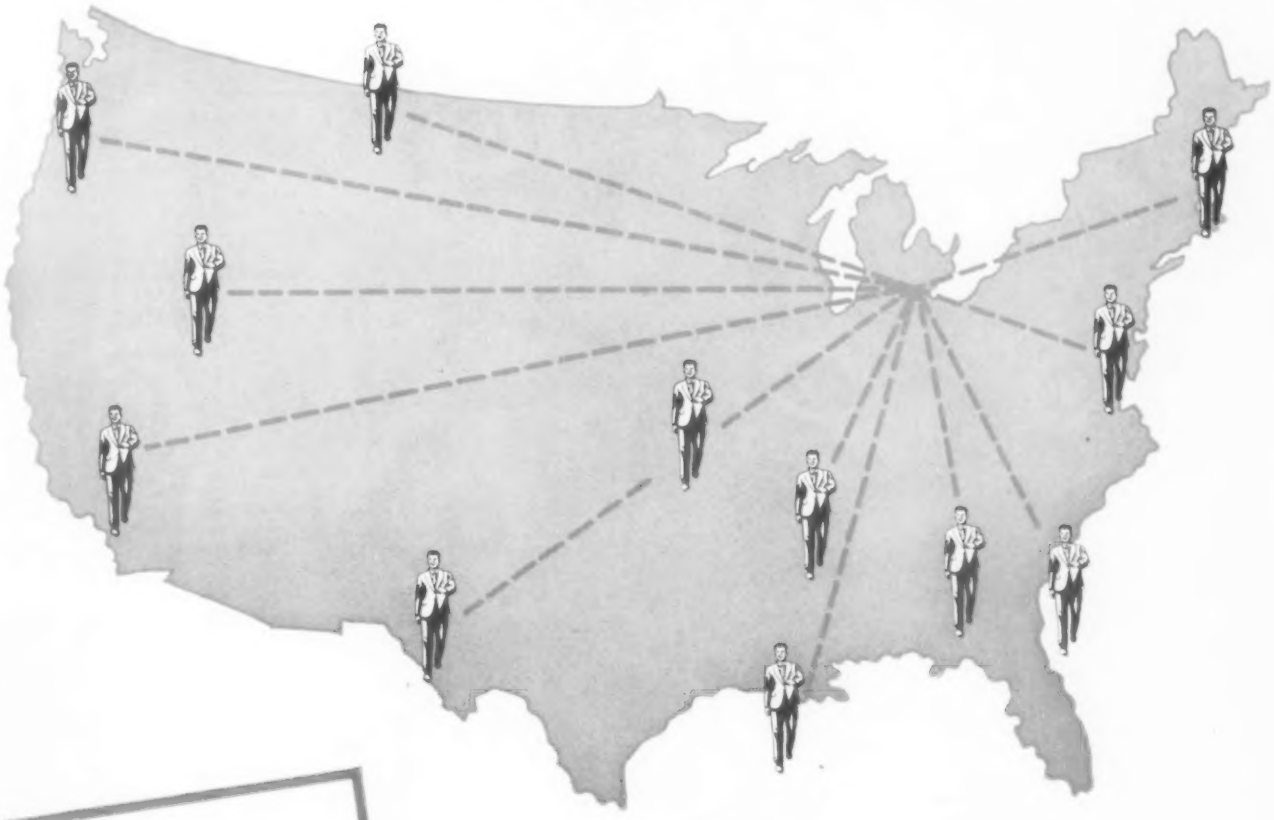
As announced by M. W. Smith, vice president, **A. C. MONTEITH** has been appointed assistant manager of Headquarters Engineering, Westinghouse Electric Corp'n. Mr. Monteith, who has been manager of the Industry Eng'g. Dep't. since '41, will direct H.Q. engineering activities in the absence of C. A. Powel, assigned to the military government of Germany in connection with electrical and radio manufacture.

JAMES A. BAUBIE has been appointed director of Public Relations for Westinghouse Electric Corporation, according to announcement by George H. Bucher, president. A native of Detroit, Mr. Baubie is a graduate of University of Michigan and, after several years of reportorial work, joined Westinghouse in 1937. Since 1943, and until assuming full responsibility, he was assistant manager of Public Relations under G. Edward Pendray, assistant to the president, who has resigned to open offices in New York as a counsel in public relations.

WM. C. VAN CLEAF has been appointed industrial relations director for the Allis-Chalmers Mfg. Co., Milwaukee, as announced by Walter Geist, company president. He succeeds Lee H. Hill, who has resigned to join the staff of the McGraw-Hill Publishing Co. Van Cleaf entered Allis-Chalmers in 1912 as an apprentice and, after his indenture, was progressively promoted to a foremanship, general supervisor of apprentice training and company employment manager. With reorganization of the industrial relations division, he was made assistant to Hill.

Users of Aro Industrial Pneumatic Tools, manufactured by the **ARO EQUIPMENT CORP'N,** Bryan, Ohio, may now be served by broadened facilities, according to R. W. Morrison, manager of the Aro Tool Division. New representatives include Genesee Supply Co., Utica, N.Y., the Stellhorn Co., Toledo, Ohio, and Cleveland Tool and Supply Co., Cleveland. J. Ernest Stroud & Co., Amarillo, Texas, Russ Chamberlin Co., Portland, Ore., Industrial Engineering Co., Davenport, Iowa, Electrical Appliance & Equipment Co., Westington, N.C., and Electric Home Headquarters, Minneapolis, Minn., have also been named representatives.

A NATIONAL Engineer is Nearby to Serve You!



Call Your DISTRIBUTOR!

Leading distributors in every section of the country have complete stocks of National Cutting Tools. Call your Mill Supply Distributor for National Cutting Tools or any staple industrial product.

NATIONAL SERVICE ENGINEERS are strategically located in every section of the country. These highly-trained specialists have had years of experience in dealing with all types of problems concerning cutting tools and their uses.

Their counsel and assistance are at your disposal. Just call the National distributor in your locality.

NATIONAL

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH. U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

DETROIT AND ROCHESTER, MICHIGAN

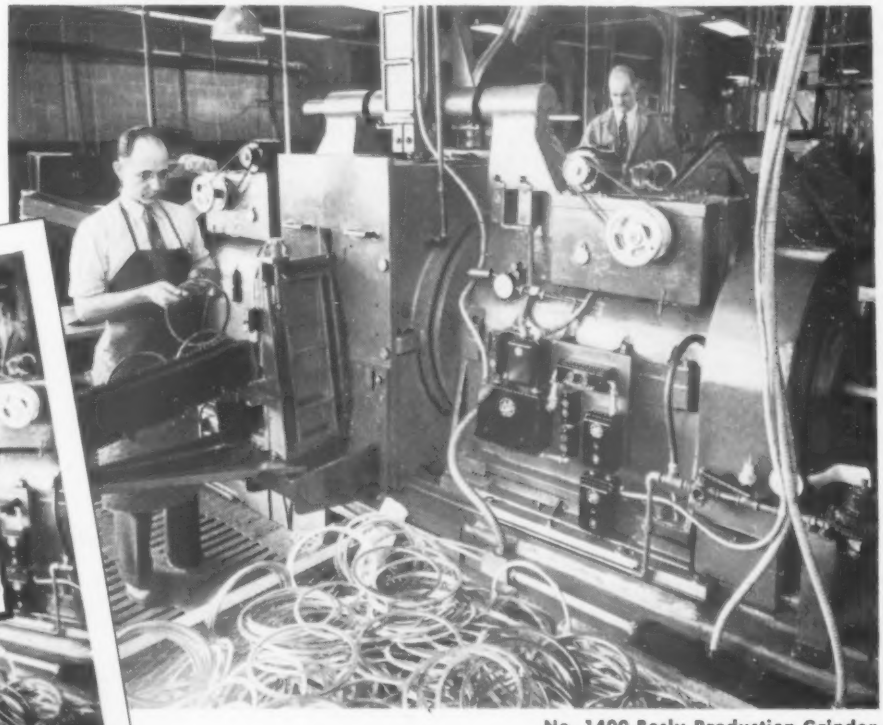
Tap and Die Division — Whitcr Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

BESLY GRINDERS *Add* sales features

to SEALED POWER PISTON RINGS

The Besly Grinder illustrated at the right, and in the ad reproduction below, is doing highly essential close-tolerance finishing in the factory of the Sealed Power Corporation, Muskegon, Michigan.



No. 1400 Besly Production Grinder

Because of the extremely close tolerance of this 42" high production grinder which produces the exceptionally fine finishes on the sides of piston rings, Sealed Power rings are free from dish, warp and twist.

The outsanding production increases and improved product quality made possible by Besly "253-42" grinders are due in no small measure to the use of oil as a coolant *with no water added.*

Other design improvements are a more rigid grinder with the largest grinding members ever used for piston ring finishing.

Result: 1. A tremendous increase in production. 2. A finished product that meets very close limits for size, flatness and parallelism. 3. A perfection of finish formerly considered impossible by production experts.

This is typical of what Besly engineers, working in close cooperation with technical experts in mass-production industries, can accomplish. Whatever your product—if grinding operations are required—*Besly engineers will be glad to help you select the right grinder and the correct abrasive to do your work accurately and quickly—at low cost.*

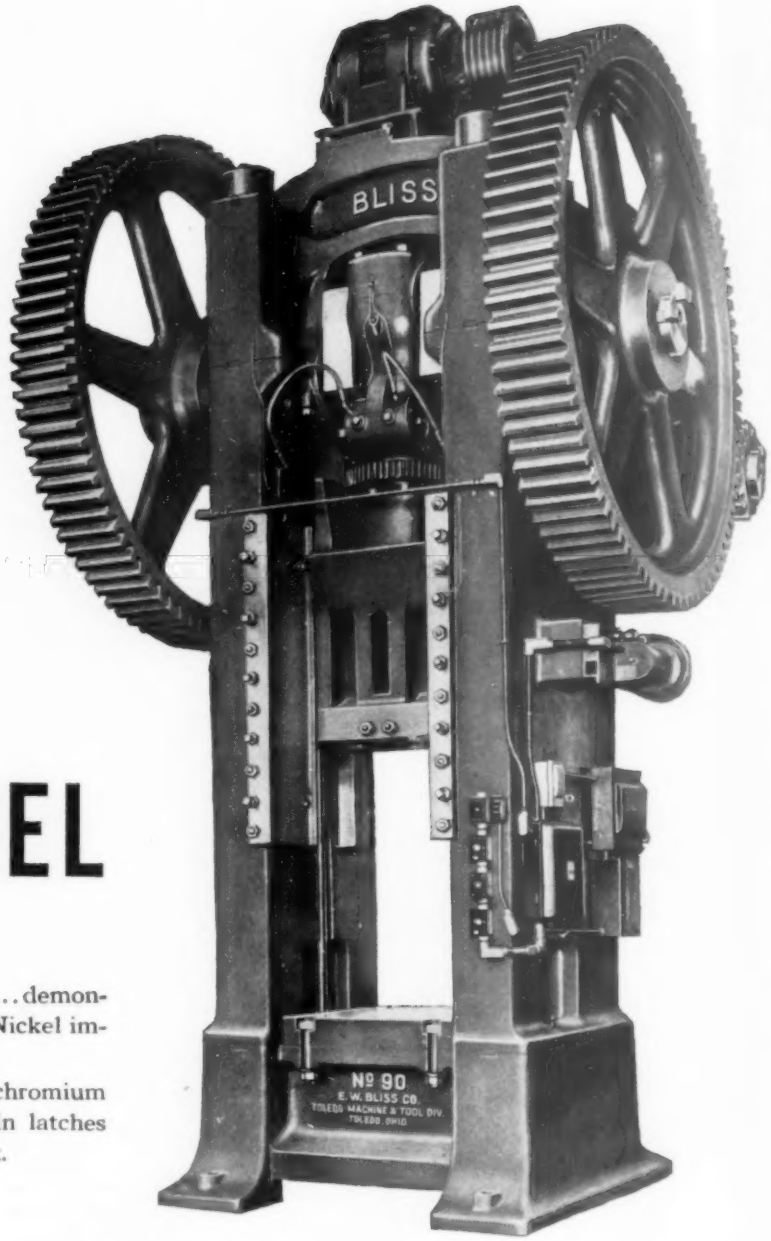
Get This Booklet

Write for it today on your business letterhead. *It's free!* You will find this booklet very useful as a timely and helpful reference on grinding wheels and abrasives. Besly Titan Steelbacs are easy to use . . . *They step up production.*

BESLY BESLY GRINDERS AND ACCESSORIES
BESLY TAPS • BESLY TITAN ABRASIVE WHEELS

CHAS. H. BESLY & COMPANY, 118-124 N. Clinton St., Chicago 6, Illinois, Factory: Beloit, Wis.

Lick wear under severe conditions with NICKEL ALLOY STEEL



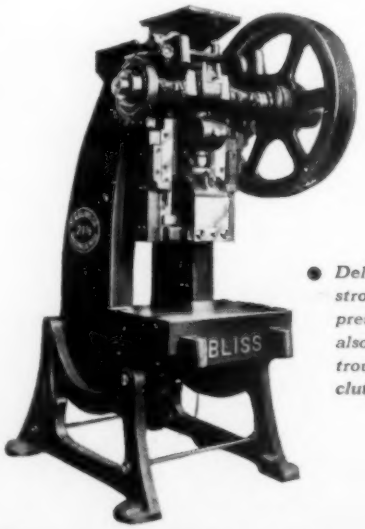
These presses ... hurling tons at every stroke ... demonstrate the tremendous stamina that a little Nickel imparts to steel.

Steel containing 1¾% Nickel and 1% chromium assures the reliable performance required in latches and clutches of this hard working equipment.

Moreover, this grade of Nickel alloy steel permits heat-treating the heads of these critical parts to hardness of 55 Rockwell "C", to secure good wear resistance.

And in shank portions, where primary requirements are strength, toughness and shock resistance ... the section is heat treated to 350 Brinell by the builders, E. W. Bliss Company of Brooklyn.

The many exceptional advantages offered by steel fortified with Nickel may help you improve your product. Send us details of your problems, for our recommendations.



● *This straight side No. 90 Bliss press, with a capacity of 440 tons at bottom stroke, incorporates latch and clutch parts fortified with Nickel to resist wear.*

● *Delivering 60 ton capacity at bottom stroke, this No. 21½ Bliss Inclinable press, built for general stamping work, also utilizes Nickel alloy steel parts for trouble-free performance of latches and clutches.*

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

Now you can have

MILLING ACCURACY *with* TAPPING SPEED

Right: Cutaway view of part shows Plan-O-Mill performing a typical internal threading operation with the cutter engaged in the thread. *Below:* Plan-O-Mill Number 1 set-up for an internal threading operation.

with the new

PLAN-O-MILL
NUMBER 1

You get both milling accuracy and tapping speed in the new Plan-O-Mill Number 1.

MILLING ACCURACY because the part does not revolve, and because of Plan-O-Mill's exclusive electronic feed control. TAPPING SPEED because this machine mills a complete thread—internal or external—in one revolution, provides a complete part in as little as 8 seconds! Blind holes are no obstacle. Set-up is simple. Operation is at the push of a button.

Plan-O-Mill Number 1 provides all these production advantages—*plus* cylindrical form milling—in a compact space-saving size requiring less than 9 square feet of floor! Let Plan-O-Mill help *you* lower unit costs by saving time, materials, tools, space and manpower. Write today for data sheet and floor plan, or contact your machinery dealer.

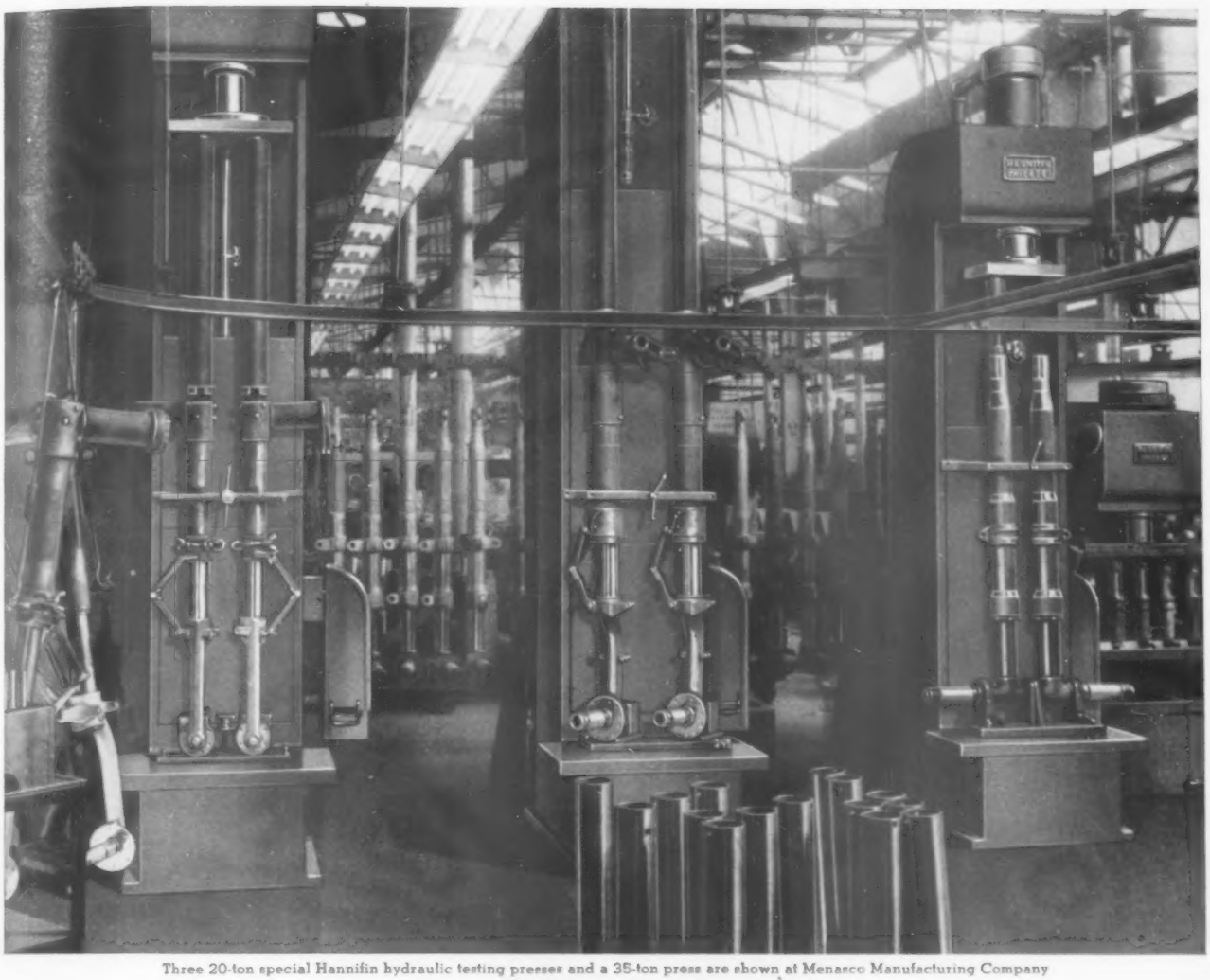
5 FIRSTS BY PLAN-O-MILL

- **First to install General Electric's remarkable new Thy-mo-trol electronic feed control!**
- **First planetary to mill external threads with standard multiple thread cutter!**
- **First planetary to coordinate feeds and speeds!**
- **First to provide absolute control of feed-in!**
- **First to offer a practical, low cost carbide thread milling cutter!**

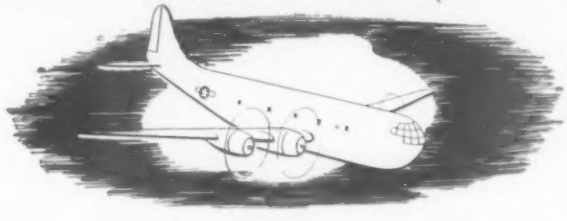
PLAN-O-MILL CORPORATION
1511 E. EIGHT MILE ROAD
HAZEL PARK, MICH.

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

THREAD AND FORM PLAN-ED MILLING CUTTERS



Three 20-ton special Hannifin hydraulic testing presses and a 35-ton press are shown at Menasco Manufacturing Company



Dry run for shock struts . . .

Landing gear shock struts for big airplanes get a real test on the ground on these Hannifin hydraulic presses—developed for this particular operation. The shock absorber struts are filled with hydraulic fluid and inflated; the Hannifin hydraulic press provides an automatic stroke—compresses and extends the struts just as in the actual landing of a heavy airplane. This cycle is automatically repeated approximately 110 times for each strut—equalling several actual landings and take-offs.

These Hannifin hydraulic presses were designed especially for this testing job—with an automatic operating cycle that matches actual landing and take-off operations. The press ram operates continuously, compressing and releasing the shock absorbers just as in actual service. Ram stroke and maximum pressure are adjustable; any required testing action is readily obtainable.

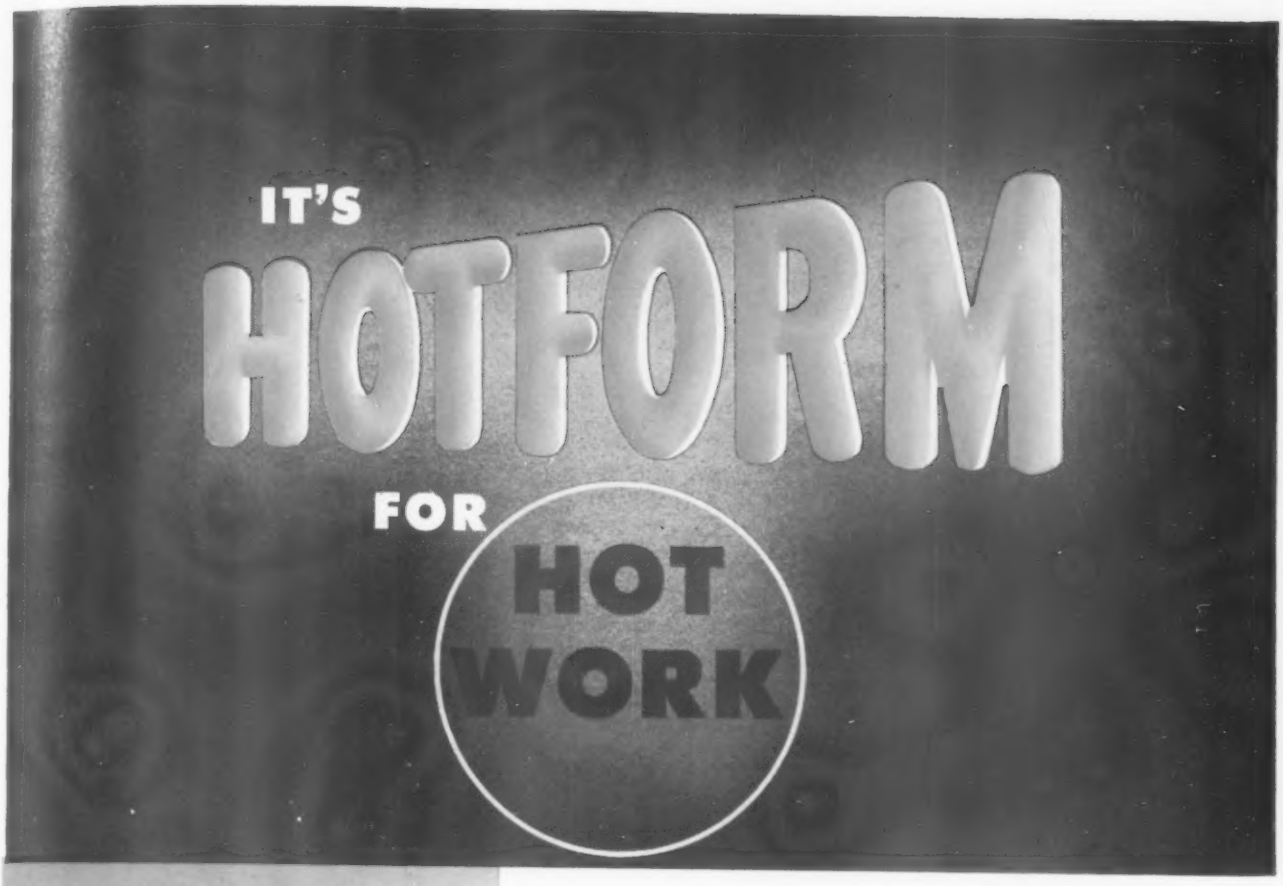
This type of hydraulic press is but one example of Hannifin design to meet special needs of present day production. Standard types are available, capacities 5 tons to 200 tons, on straightening, press-fit, testing and similar operations. Write for press bulletin with data on many standard types.

HANNIFIN MANUFACTURING COMPANY
621-631 South Kolmar Avenue · Chicago 24, Illinois

HANNIFIN CHICAGO U.S.A.

Hannifin

HYDRAULIC PRESSES



THE *ORIGINAL* CHROMIUM-MOLYBDENUM DIE STEEL

FOR MODERN DIE CASTING OF

ALUMINUM and MAGNESIUM ALLOYS

Unsurpassed in the *Qualities* You Need Most!

- **EASILY MACHINED**
- **LOW MOVEMENT IN HARDENING**
- **MODERATELY PRICED**
- **MOST SIZES IN STOCK *for prompt deliveries***

Ease of handling, that extends from shaping your dies through the heat treating process, is an outstanding characteristic of HOTFORM Die Steel. Its *usability* won immediate acceptance in the die casting field—its *performance* gained the tribute of wide duplication by the trade.

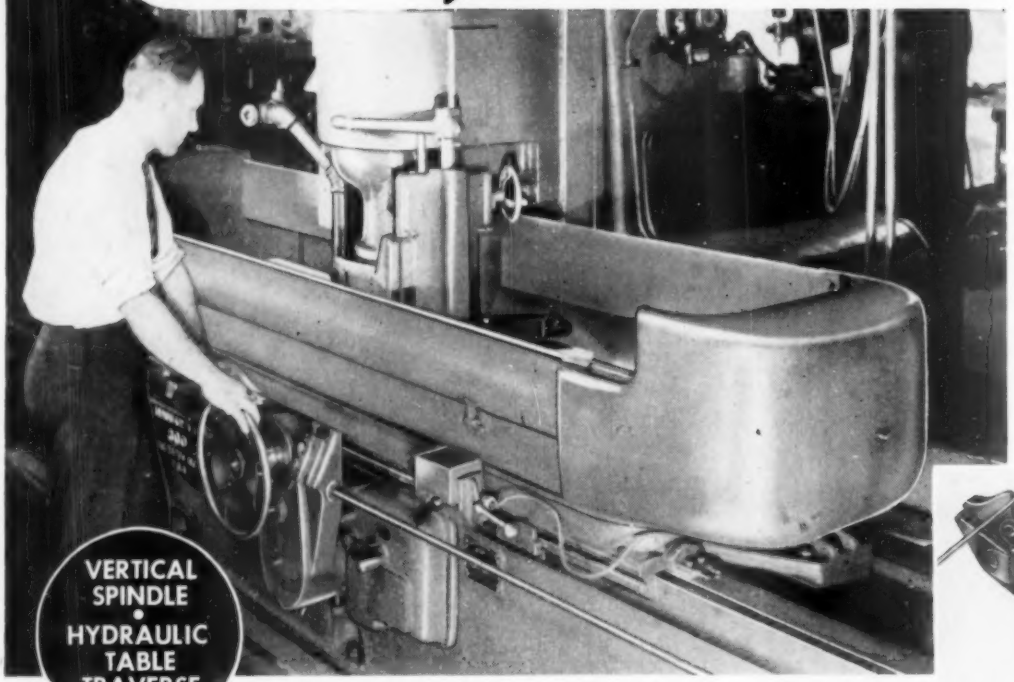
Today, HOTFORM is the top steel wherever fine dies are employed in casting aluminum and magnesium base alloys (sometimes used for white metals, too) . . . withstanding erosive action of the metals and resisting fire-checking in service . . . air hardening from low temperatures . . . non-deforming . . . forms only light scale during heat treating. Low in cost, too . . send us your inquiry.

Vanadium-Alloys STEEL CO. LATROBE, PA.

COLONIAL STEEL DIVISION
ANCHOR DRAWN STEEL CO.

MEET TOOLROOM TOLERANCES

On High Production Runs



VERTICAL SPINDLE • HYDRAULIC TABLE TRAVERSE

The Wm. Schollhorn Co., New Haven, Conn., uses this Hanchett 300 to finish-grind jaw members and other parts for Bernard Pliers. Also handles work up to 12" wide, 36" long and 10" high.

Bernard Pliers are produced in volume, sell at low cost. Grinding parts on the 300 helps keep production costs at a minimum.

with the HANCHETT "300" Surface Grinder!...

Here's a typical problem solved with a Hanchett 300 Surface Grinder:

The Wm. Schollhorn Co. manufactures Bernard Parallel-Action Pliers — mass-produced hand tools that have many replaceable and interchangeable parts. For this reason stock must be removed within extremely close tolerances — yet the finishing cost per unit kept very low.

That's why the Hanchett 300 got the job. Its long, rectangular magnetic chuck firmly grips a large number of small parts — no fixtures needed. Since the 300 is semi-automatic, operator merely loads chuck, starts machine and unloads finished pieces — a fast, simple operation. And the 300 works easily to tolerances of .0002 — assured accuracy on every piece!

USE THE 300 FOR GRINDING
Dies . . . Knives . . . File Blanks Parts for Locomotives, Automobiles, Aircraft and Home Appliances.

The Hanchett 300 is built in several sizes, for varying requirements. And remember — Hanchett manufactures *all* types of Surface Grinders. If your problem is Grinding, consult Hanchett. You can be sure of unbiased information at no obligation. Write today for Bulletin 161-8TK.

Write Today for Bulletin 161-8TK

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

HANCHETT HERMETI-COIL MAGNETIC CHUCKS

How you can CUT COSTS

with the VERS-O-TOOL

Into the *same* self-opening *head* you can insert ground thread circular chasers, or circular cutters, for end turning, end forming, recessing, knurling, burnishing or combination cutters for threading and forming.

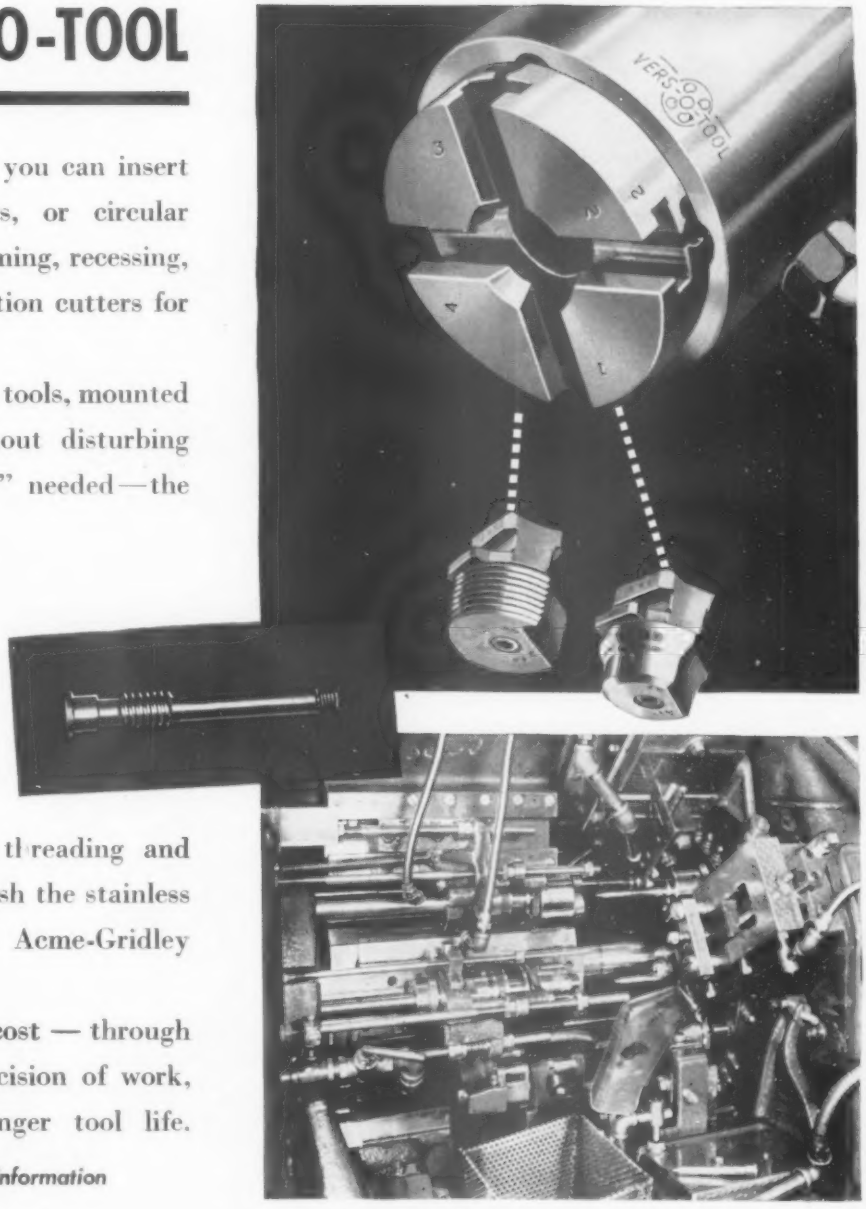
Then you can insert reground tools, mounted on blocks, in *one minute*, without disturbing the setup. No "trying for size" needed—the first piece is production.

And finally, ground thread circular chasers and circular cutters last 10 to 50 times longer — they may be reground through 270° circumference.

Three Vers-o-tools—two for threading and one for forming—are used to finish the stainless steel valve stem shown, on an Acme-Gridley Bar Automatic.

Job produced at new low cost — through money saved on speed and precision of work, lower tool investment and longer tool life.

Catalog C-42-B gives complete information



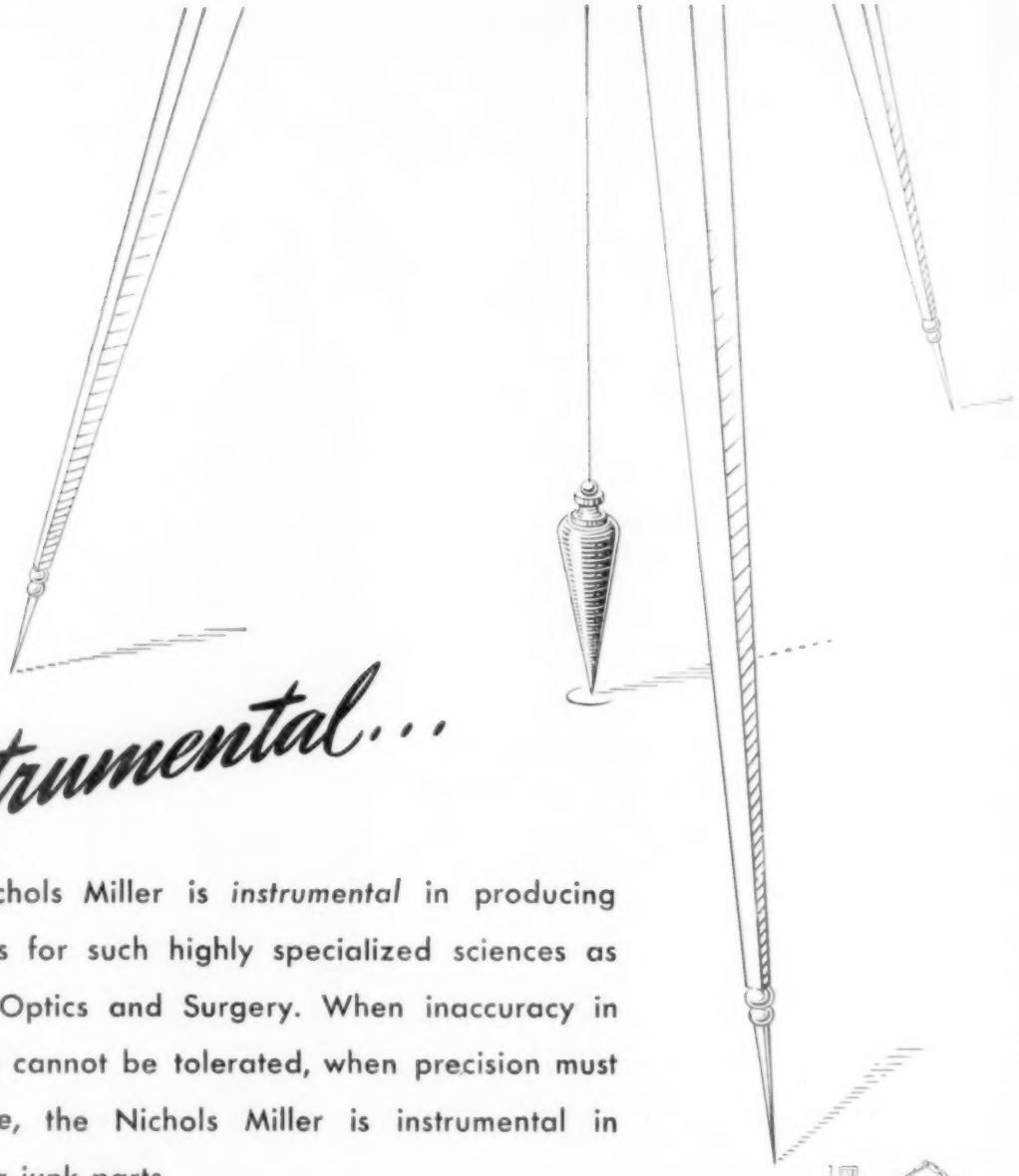
The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

COLLETS AND PUSHERS

The design, materials and methods of processing GENUINE Acme-Gridley Collets and Pushers are vital to continuous low-cost performance on your Multiple Spindle Automatics.

Bulletin CP-45



Instrumental...

The Nichols Miller is *instrumental* in producing instruments for such highly specialized sciences as Aviation, Optics and Surgery. When inaccuracy in machining cannot be tolerated, when precision must be *precise*, the Nichols Miller is instrumental in eliminating junk parts.

As a middle-sized machine, the Nichols Miller is ideal for many second operations — for the light and medium cuts peculiar to the instrument-making field.

When the manufacture of your instruments requires an *extra* degree of accuracy, economy and speed in production, use the Nichols Miller.

Send for this catalog on the Nichols Miller today.

THE *Nichols* MILLER

MANUFACTURED BY W. H. NICHOLS & SONS, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS: NICHOLS-MORRIS CORP., 46 CHURCH ST., NEW YORK 7, N. Y.

GET BETTER FINISHES · SAVE TOOL WEAR

Atlas COOLANT PUMP SYSTEMS

Quickly and easily attached to any type machine tool — lathes, screw machines, drill presses, milling machines, cut-off tools and saws — Atlas coolant systems can help you speed up production and reduce tool-wear. New design centrifugal type pump has no gears to wear — is not affected by dirty or gritty fluids. Feed and return lines made of oil and caustic resistant extruded plastic, tough and non-kinking. Flow control valve adjustable from drip to fast washing stream. Two sizes and prices as shown below ready for quick delivery.

No. W89 SYSTEM $49.75 F.O.B.

5 GAL. TANK
450 G.P.H. CAPACITY
Universal Motor 110-120V AC-DC
6000 RPM

No. W88 SYSTEM $39.75 F.O.B.

2½ GAL. TANK
225 G.P.H. CAPACITY
INDUCTION MOTOR
110-120V AC-DC 50-60 Cycle AC
3450 RPM

STANDARD EQUIPMENT INCLUDES:

VALVE TO CONTROL FLOW FROM DRIP TO FAST WASH

NOZZLE and FLEXIBLE METAL TUBE

SELECT CLAMPING DEVICE YOU NEED AND SPECIFY IT BY NUMBER

No. W-97
HAS EXTRA LENGTH FEED AND FLAT BRACKET

OR

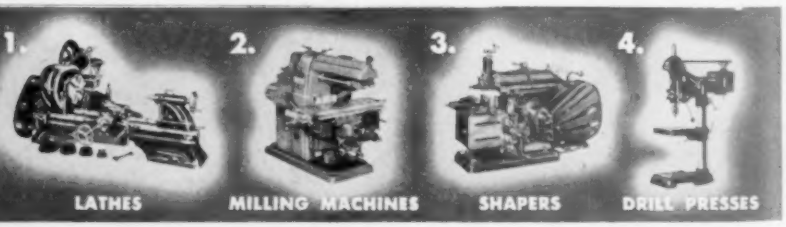
No. W-96
HAS FLAT-TYPE BRACKET FOR BENCH LATHES ALSO ADAPTABLE FOR OTHER TOOLS

OR

No. W-98
COLLAR CLAMP FOR DRILL PRESSES AND OTHER ROUND OR IRREGULAR SURFACES

Order from your Atlas distributor. Specify clamping device by number. Coolant systems also available for multiple spindle drill presses. Send for descriptive literature and prices. Atlas Press Company, 1114 No. Pitcher St. Kalamazoo, Mich.

Atlas 4 TOOL TEAM FOR SMALL-PARTS MACHINING



GAGES
from a fine family

Two things you look for when selecting Gages—initial accuracy and maintained accuracy.

Gages bearing the PM Diamond Emblem qualify on both of these excellent family characteristics.

Beginning with the right steel, we machine and grind to the high standards demanded by today's precision work, and then finish to insure long life in service.

Pipe Machinery maintains a large stock of standard Plug, Ring and Thread Gages, from which prompt shipments are made to meet emergencies. Wire Department EX for this quick delivery service.

Special Gages and Cutting Tools are engineered by experts and built on special order. Send us details of what you want to accomplish.

PMCO

ARMY E NAVY

The PIPE MACHINERY COMPANY Cleveland, O.

POSITIVE GAGING WITH ELGIN SAPPHIRE GAGES *is speeding our peacetime production*

You don't have to "baby" an Elgin Sapphire Gage. This one has been used more than a year and a half . . . gaging more than a million close-tolerance piece parts.

Elgin Sapphire Dimensional Fidelity Saves Man-hours . . . Materials . . . Money!

All too often, gage quality alone determines the difference between rejection or acceptance of satisfactory parts. That's why hundreds of manufacturers specify Elgin Sapphire Gages. The almost unbelievable dimensional fidelity of Elgin Gages is helping to improve and increase production, cut down costs and save waste. Get the facts!

Here are the answers to some questions you're sure to ask about Elgin Sapphire Gages:

Q. Why are manufacturers everywhere installing Elgin Gages? **A.** They cut production costs. (Case history proofs gladly furnished.)

Q. Will Elgin Sapphire Gages burr? **A.** No. They are not subject to burring as are steel gages. It is impossible to gage parts inaccurately as a result of unnoticed damage to the gage.

Q. Are they available in all sizes? **A.** Yes. No "wear allowance" need be made.

Q. Will sapphire "walk?" **A.** No. Sapphire is not subject to phase changes affecting steel and other metals. It permanently maintains dimension. Elgin Sapphire requires no seasoning or aging . . . is chemically inert and inherently stable.

Sapphire Products Division of the

ELGIN NATIONAL WATCH COMPANY

Aurora, Illinois, U. S. A.

Investigate Elgin Sapphire for: GAGES . . . THREAD GUIDES . . .EXTRUSION DIES . . . KNIFE EDGES . . . SPRAY NOZZLES . . . SOFT WIRE DIES . . . BURNISHING TOOLS . . . PRESSURE VESSEL WINDOWS . . . HONING STONES

SALES SOLICITORS:

NEW YORK CITY
John F. Diehl Company,
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BUFFALO, NEW YORK
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John E. Larrabee Co.,
3 Market Street

CHICAGO, ILLINOIS
Elgin National Watch Company,
35 E. Wacker Drive

ANDERSON, INDIANA
Mr. R. L. Witsche,
Dist. Eng.,
1030 Sherman Street

CLEVELAND, OHIO
Production Tool Co.,
2479 Lee Road

DETROIT, MICHIGAN
Charles R. Burgess & Asso.,
838 Maccabees Building

OAKLAND, CALIFORNIA
H. E. Linney Company,
5801 College Avenue

LOS ANGELES, CALIFORNIA
Burklyn Company,
3429 Glendale Blvd.

PORTLAND, OREGON
Burklyn Company
723 E. Burnside Avenue

SEATTLE, WASHINGTON
Burklyn Company
1305 Dexter Avenue

ELGIN
Sapphire Gages
DIMENSIONAL FIDELITY IN GAGING OPERATIONS

10" Wet or Dry CARBIDE GRINDER

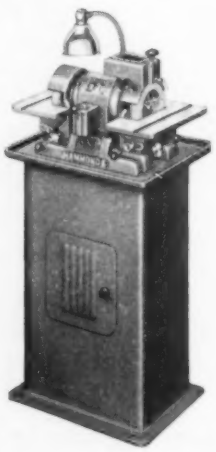
"You're dry when you grind wet" — due to No Splash — No Spray, patented, wheel guards.

Hammond of KALAMAZOO

CARBIDE TOOL GRINDERS

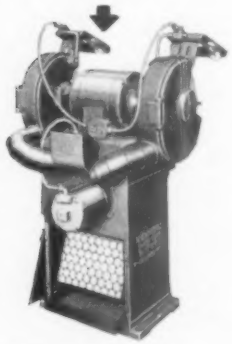
MOST COMPLETE LINE FOR EITHER WET or DRY OPERATION

CB-76
Chip breaker and diamond finishing grinder for fast, smooth, accurate, vibrationless operation. Accomodates 7" cup wheel on left side, 6" diamond wheel on right side.



6"
Heavy construction — 6" cup wheel grinder is ideal for rough and finishing all small carbide tools and for diamond finishing on large size tools.

POPULAR NO DUST GRINDER



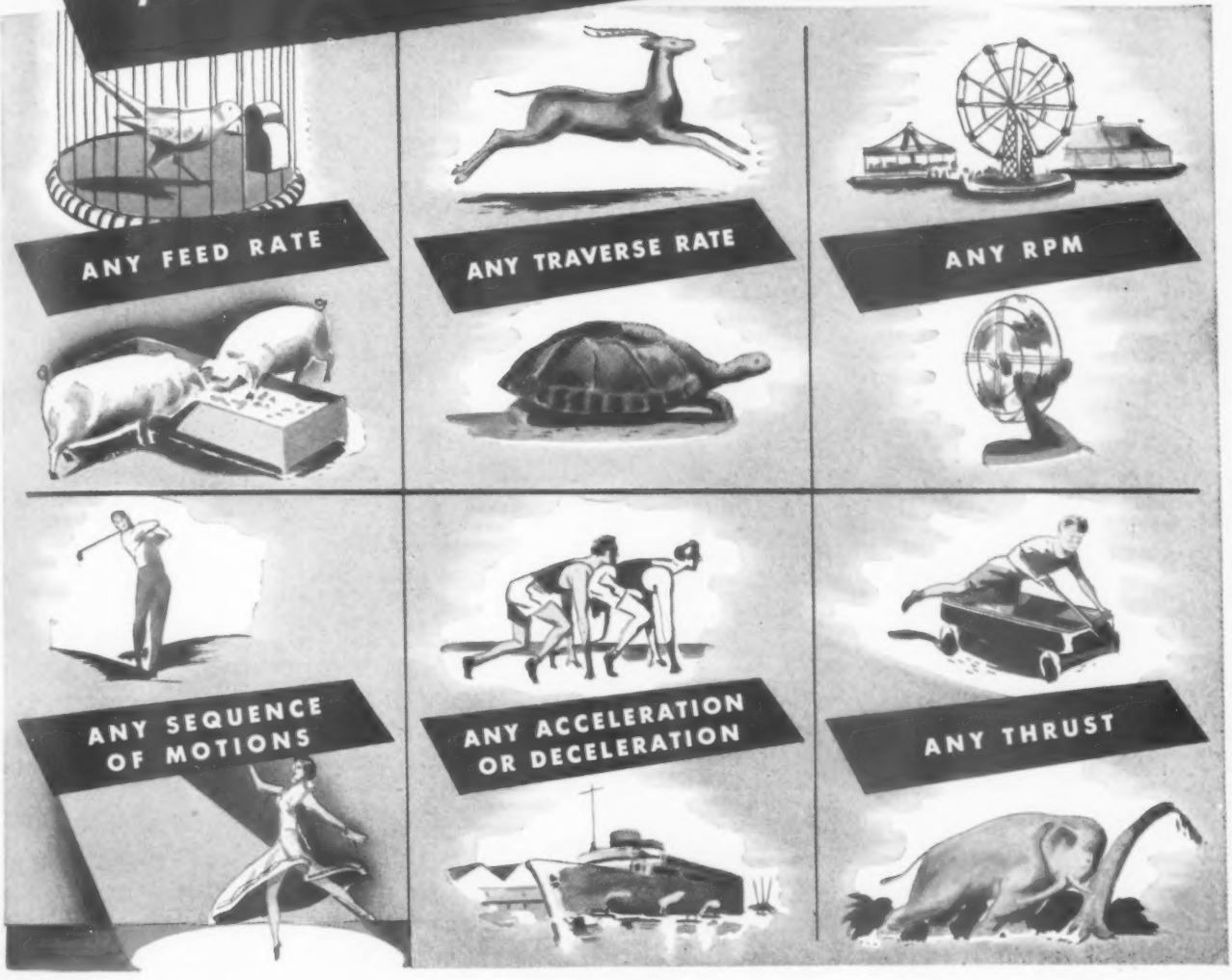
10", 12", 14" —
No-Dust grinders with built-in dust collector . . . save space! Can be used for general tool grinding and grinding steel shanks on carbide tools.

HAMMOND PRODUCTS — Carbide, General Purpose and Abrasive Belt Grinders • Automatic and Cylindrical Finishers • Polishing Lathes

Hammond Machinery Builders INC.

1661 DOUGLAS AVE. KALAMAZOO 54, MICHIGAN • EASTERN BRANCH: 71 WEST 23rd ST., NEW YORK 10, N. Y.

VERSATILITY that *Exactly* meets your needs in MACHINE TOOLS



Machine tool design is set free from a host of limitations when Vickers Hydraulic Controls and Drives are used. With no difficulty at all, the designer has an extremely wide choice of feed rates, traverse rates, RPM, sequence of motions, accelerations or decelerations, and thrusts.

Practically any machine tool can be designed *and built* to do *exactly* the required job by using Vickers Hydromotive Controls in one of the infinite number of combinations provided by more than 5000 standard Vickers Units.

In addition, positive overload limitations can be built into any machine—definite safety factors provided for both the machine and the operator.

Only Vickers Hydraulic Controls provide *all* the advantages of hydraulic operation—including exceptional compactness and reliability.

Let Vickers Application Engineers consult with you on your new designs.

VICKERS *Incorporated*

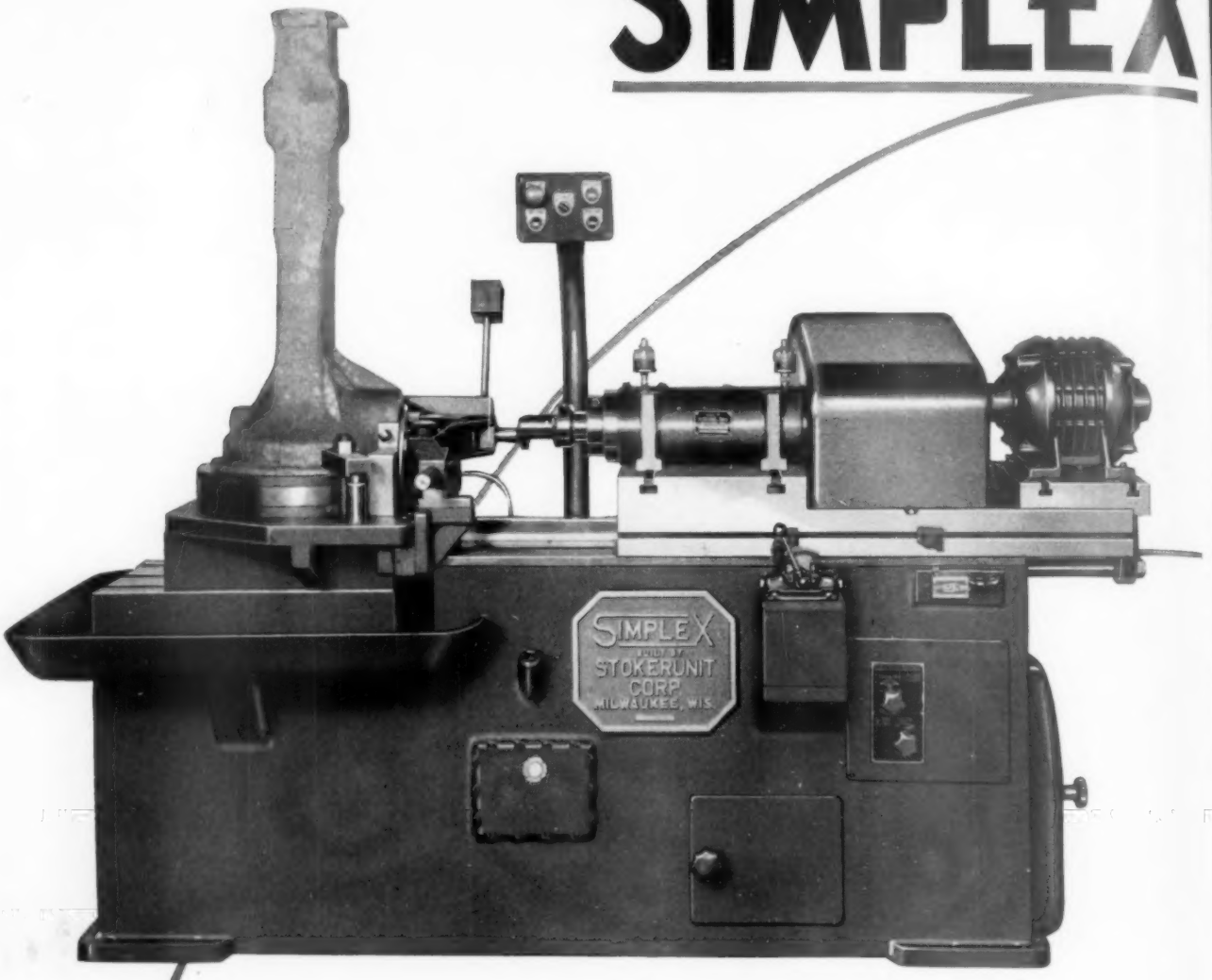
1416 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: Chicago • Cincinnati • Cleveland Detroit • Los Angeles • Newark • Philadelphia • Rochester • Rockford Tulsa • Worcester

VICKERS Hydraulic CONTROLS and DRIVES

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

SIMPLEX



Bulky and awkward pieces are difficult precision boring jobs. Couple this with the necessity of locating from previously machined surfaces and for handling several sizes and types of pieces in the same fixture and you have a boring problem.

This SIMPLEX 2U Single-end Precision Boring Machine was tooled for pinion bearing bores in rear axle sections and it was necessary to locate from the differential joint surface and the previously finished face on the boss. The low base of the machine made it possible to use an ample size fixture without raising the piece beyond a convenient operating height, and a dial indicator type gauge provided to give correct reading of the alignment was adaptable to all of the several pieces handled.

Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4528 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools


REVOLUTIONIZING PRODUCTION
VASCOLOY-RAMET
Tantalum/Tungsten
CARBIDE
TOOLS and BLANKS
No other type of metal can approach the production records of Cemented Carbide tools and dies. Vascoloy-Ramet Tantalum/Tungsten Carbide, the hardest, fastest cutting metal known to science is revolutionizing the machining of steel and non-ferrous metals.
For your reconversion schedules, test these tools for maximum efficiency and minimum cutting time. Write for Bulletin VR-360.
VASCOLOY RAMET CORPORATION
An Affiliate of Fansteel Metallurgical Corporation and Vanadium-Alloys Steel Company
NORTH CHICAGO, ILLINOIS • DISTRICT SALES & SERVICE IN PRINCIPAL CITIES
4533
WORLD'S FINEST CARBIDE TOOLS

WENDT-SONIS

the most complete line of

STANDARD CARBIDE TIPPED CUTTING TOOLS

W-S STANDARD REAMER WITH CARBIDE TIPS . . . Straight or tapered shanks. Sizes ¼" to 1½" diameter. Also Jobber, Right Hand Spiral and Left Hand Spiral Styles.

W-S INSERTED TOOTH CUTTER . . . Requires up to 30% less power than ordinary cutters. For milling all types materials. Highly efficient. Low maintenance costs. Long service life.

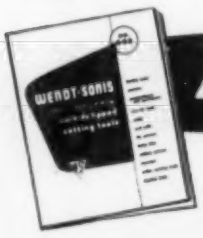
W-S UNIVERSAL FLY CUTTER . . . For both ordinary and step-milling jobs on all materials. New blade design requires less power. Uses standard W-S blades quickly reground on bench grinder.

The Wendt-Sonis line is complete . . . you will find it to contain a wide range of standard sizes and types. The Wendt-Sonis line is standard . . . this means uniform quality . . . rapid service from complete distributor and factory stocks.

Wendt-Sonis produces cemented, carbide tipped cutting tools exclusively . . . this assures a high standard of perfection. There's longer life between sharpenings in the Wendt-Sonis line . . . the marked preference of tool engineers for W-S tools is evidence of this.

W-S FACTORY TRAINING COURSE . . . FREE!

One week's intensive training, at our factory, in application, use and maintenance of carbide cutting tools. Small classes, individual instruction. Practical facts, actual shop practice. Write for details.



FREE! new cutting tool catalog 445

Write Wendt-Sonis Company, Hannibal, Missouri. Contains specifications and latest prices on all these carbide tipped tools:

REAMERS • END MILLS • LATHE CENTERS • SPIRAL REAMERS • BORING TOOLS • STUB SPOT FACERS • SLOTTING CUTTERS • COUNTERBORES and SPOT FACERS • END MILLS • FLY CUTTERS • CORE DRILLS • ROLLER TURNING TOOLS • SPIRAL END MILLS • GRINDER HALF CENTERS • CUT-OFF TOOLS • TWIST DRILLS

Case Histories

Pictorial booklet explains THOMPSON TRUFORMING

. . . production with COMPLETELY ENGINEERED Crush Form Contour Grinders

THE fully automatic Crush Form Contour Grinder, illustrated above, is one of the (Thompson Truform) surface grinders *completely engineered* as a unit and built by the Thompson Crush Form Contour Grinding Development Laboratory to mass produce a complicated precision contour. The complete story of this application, together with the development of a semi-automatic (Thompson Truform) machine for job-lot contour production and regular surface grinding, is included in a new 16-page pictorial book, entitled "Facts About Crush Form Grinding Precision Contours." This book, the first of its kind, is a result of ten years of pioneering research and engineering by THE THOMPSON GRINDER COMPANY, SPRINGFIELD, OHIO.

Get these facts today!

Crush-Form-Contour-Grinding
Development Laboratory
The Thompson Grinder Company, Inc.
Dept. 16, Springfield, Ohio

Gentlemen: Please send me the 16-page pictorial book of facts about crush-form contour grinding on completely engineered surface grinders (the process known as Thompson Truforming).

NAME_____

POSITION_____

COMPANY_____

ADDRESS_____

CITY_____

ZONE_____ STATE_____

TOOL STEEL DATA

Revised data for Hot Work and Shock Resisting Die Steels including types, analyses, uses, hardening characteristics and temperature ranges

NOVEMBER, 1945

HOT WORK AND SHOCK RESISTING DIE STEEL CHARACTERISTICS

TYPE	GRADE	ANALYSIS	USES For Hot Work Dies and Tools, and Tools Subject to Severe Shock Requiring:	HARDENING CHARACTERISTICS	
				HARDENING TEMPERATURES	QUENCH RC
High Tungsten	FORMITE	C .35 Cr 4.00 W 13.50 Mo .40 V .35	• Highest Resistance to Heat • Long Wearing • High Strength	Range: 2150° F. to 2250° F.	Oil.....48-53 Air.....45-50
Chrome-Molybdenum	FIREDIE	C .35 Si .95 Cr 5.25 Mo 1.35 V .50	• Best Resistance to Fire Checking • High Shock Resistance • Air Hardening in Massive Sections	Range: 1800° F. to 1850° F. The total time allowed for preheating and holding at the hardening temperature should be at least 3 hrs. per inch of thickness.	Air.....50-55
Low Tungsten	BUSTER	C .60* Si .70 Cr 1.20 W 2.15 V .25 *other carbons available.	• Working Temperatures Up to 800° F. • Greatest Shock and Pressure Resistance.	Range: 1650° F. to 1750° F.	Oil.....50-60 Hardness depends on Carbon, Mass and Hardening Temperature.
TEMPERING: For hot work the rule is: temper at as high a temperature as working conditions will allow. Double tempering of FORMITE and FIREDIE is recommended. FORMITE and FIREDIE are usually tempered between 1000° F. and 1300° F. For BUSTER the range is from 400° F. to 800° F.					

COLUMBIA TOOL STEEL COMPANY

MAIN OFFICE AND WORKS — CHICAGO HEIGHTS, ILLINOIS

Branches and Warehouses: CHICAGO • CINCINNATI • CLEVELAND • DETROIT MILWAUKEE

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING

Tracer Control SAVED 120 HOURS Duplicating Eight (8) Die Molds for *Plastics*

8 Dies Duplicated from 1 Original Master

ON THIS TYPICAL JOB that previously took 40 hours per die—the Gorton Duplicator gave this manufacturer a Tracer-Controlled machining method that saved 15 hours' actual machining time per die in the production of 8 die molds for plastic handles. Simplicity of setups and Gorton improved finish which eliminated any hand finishing operations brought additional savings.

You will find the Gorton 8½-D Duplicator the ideal machine tool for all kinds of die and mold work, capable of duplicating any part accurately with extremely fine finish. On many war jobs today, Gorton Duplicators are paying for themselves in savings effected.

PRODUCTION DATA

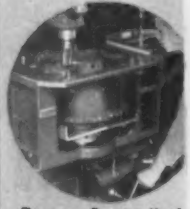
Material—Machine Steel.
Operation—Duplicating Die Molds for Plastic Handles.
Speed—Roughing, 500 r.p.m.
Finishing, 1100 r.p.m.
Time—25 Hours per Mold, Floor-to-Floor.
Holding Method—Simple Table Vise.
Accuracy—.001" with Extra Fine Finish.
Savings with Tracer Control—15 Hours per Die—Total Savings—120 Hours per 8 Dies.

FREE ENGINEERING SERVICE

There is a "Tracer-Control" solution to your machining problem. Submit it to Gorton engineers who have had more than 50 years of practical experience in the development of Tracer-Controlled Milling. Call on your nearest Gorton Dealer, or write to the Gorton factory at Racine, Wisconsin.

The *Right* Size The *Right* Type of Machine for Every Job . .
From 2 oz. to 2 ton

DIE BLOCKS



Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON ARMY E NAVY

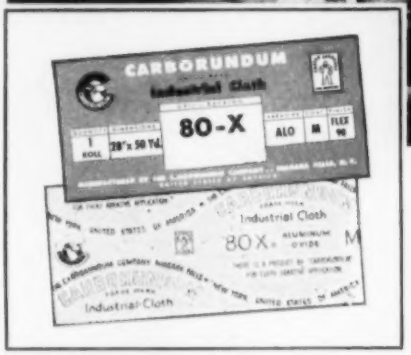
GORTON *Precision* MACHINES

TEAR OFF COUPON AND MAIL TODAY

George Gorton Machine Co.,
2611 Racine St., Racine, Wis.
Send me these free books
☐ Condensed Catalog
☐ Die and Mold Duplicators

Name..... Title.....
Company.....
Address.....
City..... State.....

HERE'S HOW TO GET THE RIGHT COATED ABRASIVE — everytime!



NOW the Coated Abrasives by "CARBORUNDUM" have the specifications clearly and simply marked on *both* the labels and backing materials! Thus, when the material is in use in the shop, you can tell what to requisition from the stockroom. And the stockroom, from either labels or backing material can tell at a glance what to ask the purchasing department to reorder. A glance at the picture of label and backing will tell you how this new marking system for Coated Abrasives by "CARBORUNDUM" makes it easy to identify, specify and order this popular line of coated abrasive products. The Carborundum Company, Niagara Falls, New York.

THERE IS A PRODUCT BY

CARBORUNDUM

TRADE MARK

FOR EVERY ABRASIVE APPLICATION

("CARBORUNDUM" is a registered trade mark of and indicates manufacture by The Carborundum Company)

OILGEAR POWER'S GENTLE TOUCH

Oilgear Fluid Power Units of this type are used for roll hold-downs and lifts on many types of paper machines.

Short fine "hairs" of cellulose actually floating in water are what paper is made of. Matted together in a moist, fragile web they are passed through successive rollers. Each set of rollers squeezes more water out until finally the substance is recognizable as paper.

But what precision of controlled and irresistible power is needed in the opposing rollers . . . not only to preserve the fragile web hundreds of feet long but to insure uniform moisture extraction and unvarying calibration of thickness.

Here, and on other types of paper machines and printing presses, Oilgear Fluid Power hold-downs and lifts maintain that important squeeze indefinitely at any degree of exquisite fineness. There's independent pressure adjustment for each end of roller from a convenient panel. There's power to lift and hold up the rolls. Yes, the positive action, the steady preset pressure, the utter controllability of force, smooth gliding acceleration and deceleration make Oilgear Fluid Power the ideal solution to straight line and rotary power transmission problems. You should know what Oilgear can do for you; you should not wait. . . . Write THE OILGEAR COMPANY, 1308 W. Bruce Street, Milwaukee 4, Wisconsin.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without preset time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full preset automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

OILGEAR

Fluid Power

WHY MONSIEUR DESCHAMPS NEVER OWNED A CAR

IT isn't that he never wanted one. A Frenchman of the upper middle class appreciates the good things of life. But the bitter truth is that French industry never produced a car that Monsieur Deschamps (or 85% of French families) could afford. Yet, the motor car was invented in his country.

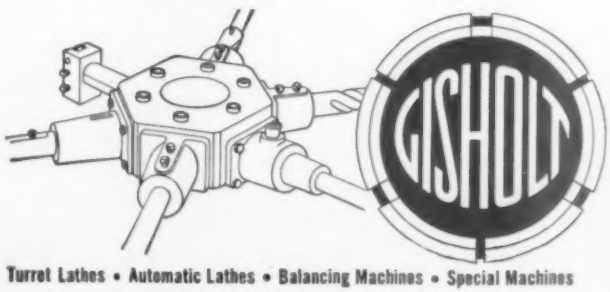
Yes, the first automobile rolled in Paris. But the first assembly lines rolled in Detroit! And they reached a peacetime tempo where "a car for every family" came nearer fact than fancy—where America's automotive industry was producing more cars in six months than existed in all of France.

Swift-moving assembly lines are only the symbol of mass production. Look behind them and see how they're fed. You'll find, for example, *mass machining*—the producing of as many as 3,600 machined parts in a single automobile. Multiply that by nearly 5,000,000 cars a year and you see the need for speed and accuracy to get costs down where the average family can own one.

In those long rows of machine tools you'll find many with the name "Gisholt." And you'll find Gisholt engineers, too, working hand in glove with manufacturers in the never-ending search for ways to do the job still better, at still lower cost. It's a constant challenge to do our part for an industry that creates employment for nearly 7 million people and contributes so much to the enjoyment of life in America.

GISHOLT MACHINE COMPANY

1257 East Washington Ave • *Madison 3, Wis.*



Turret Lathes • Automatic Lathes • Balancing Machines • Special Machines

Civilian Production means Press Production

Stampings played a major part in the streamlined conversion of America's facilities to war production. In reconversion to civilian production, they will play a similar, or greater part.

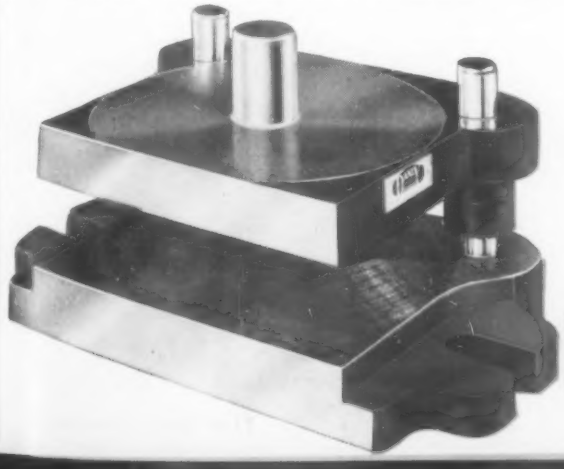
The greatest possible use of stampings is the fastest way to speed production—in war and in peace.

DANLY PRECISION DIE SETS will speed your stampings production in diemaking—and in manufacture—because of their *known dependable accuracy.*

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue, Chicago 50, Illinois

DANLY National Assembly

- **MILWAUKEE 2** — *111 East Wisconsin*
- **DETROIT 16** — *1549 Temple Avenue*
- **CLEVELAND 14** — *1550 East 33rd Street*
- **DAYTON 2** — *990 East Monument*
- **ROCHESTER 4** — *16 Commercial Street*
- **PHILADELPHIA 40** — *3858 Pulaski Avenue*
- **LONG ISLAND CITY 1** — *47-28 37th Street*
- **DUCOMMUN METALS & SUPPLY CO.** — *4890 South Alameda, Los Angeles*



DIE MAKERS SUPPLIES

DANLY DIE SETS

Welded Steel Fabrication

GEROTOR

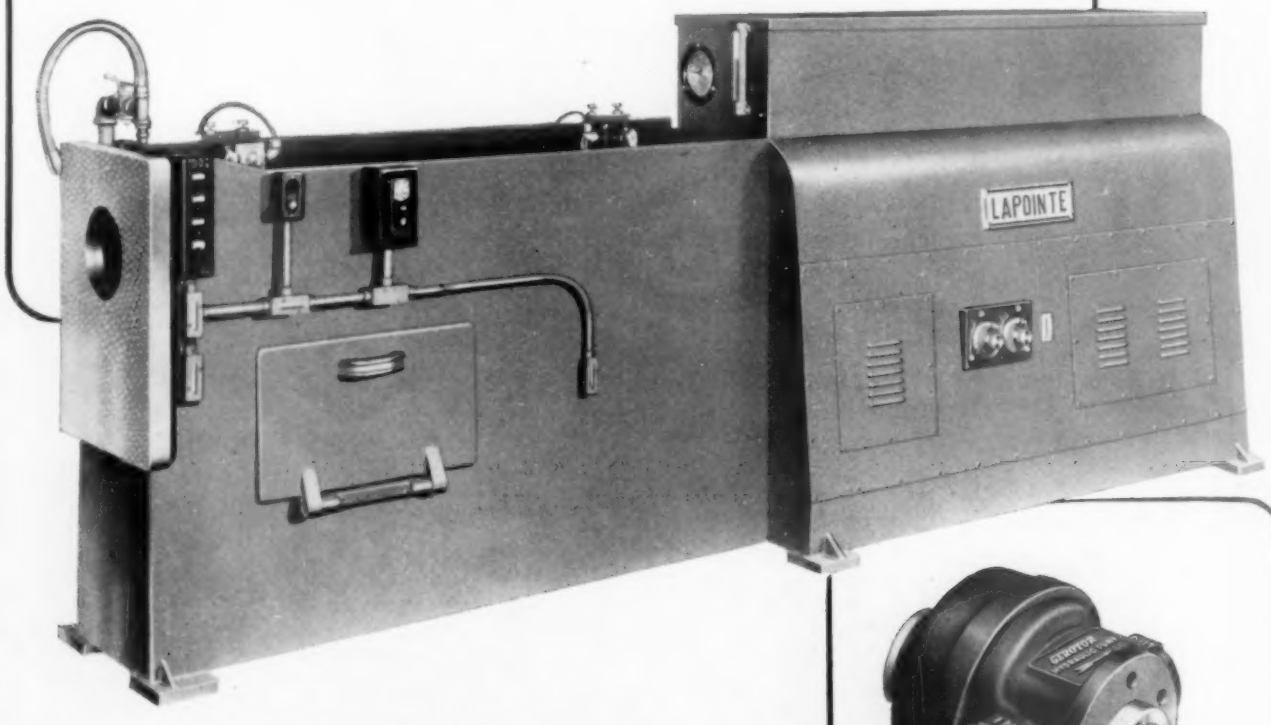
HYDRAULIC PUMPS

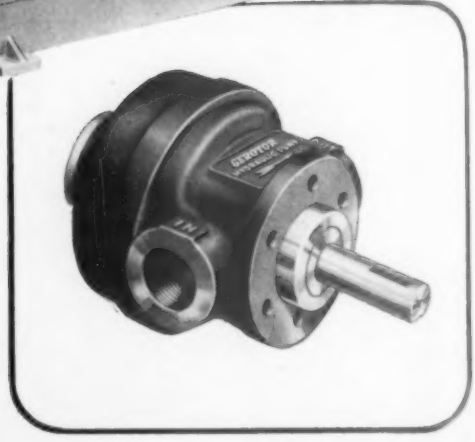
An important part of

LA POINTE

HORIZONTAL BROACHING MACHINES

Gerotor Hydraulic Pumps are used on La Pointe Horizontal Broaching Machines, just as they are on many other fine products. Perhaps you, too, have a need for hydraulic pumps. If you have such a problem, why not let Gerotor help you solve it?





GEROTOR MAY CORP.

Baltimore 3, Maryland

Plants at Logansport, Ind. and Baltimore, Md.

An eight-page brochure illustrating and describing Gairing's new Block-type Boring Bar is now ready for distribution. It contains information never before available.

The money-saving simplicity of this new tool, its unique quick-change and self-centering features are fully explained in terms that anybody can understand.

Every production engineer in the metal working industry, every tool supervisor, every master mechanic should have a copy of this book.

WRITE FOR YOURS TODAY

Every 8½" x 11" page, and there are eight of them, is chock full of usable information . . . fully illustrated . . . text is reinforced with many charts and diagrams.

THE GAIRING TOOL COMPANY

21221 HOOVER ROAD, DETROIT 32, MICH.

GAIRING TOOLS

DESIGNERS AND MANUFACTURERS OF STANDARD, SPECIAL AND INSERTED BLADE END CUTTING TOOLS

Salvage

your surplus war plug gages —both plain and thread types

Plug gages of any make purchased for war production, unsuitable for your "peacetime" precision manufacturing, can be traded in on new GO AND NO-GO CHROMIUM PLATED REVERSIBLE Gages. The savings are substantial to users of Size Control quality gages.

These four features of Size Control GO AND NO-GO REVERSIBLE GAGES assure even greater savings to new users:

REVERSIBILITY — provides for reversing plugs at each end of the universal handle.

EXTRA LENGTH — plugs can be cut off an average of three times at each end as they become worn, giving six times more service life than ordinary gages.

SUPER-FINISHED — to minus 1½ micro inches, greatly reducing friction and increasing service life.

COLORED GO AND NO-GO INDICATORS — Green GO and Red NO-GO nuts for quick identification.

GO and NO-GO Gages are available in all standard sizes, from stock. Special sizes made to order of Stellite, Carbide, Norbide and up to .250" in sapphire. Bulletin No. 945 will help to cut your inspection costs.

OUTSTANDING VALUE IN PLUG GAGES

Both GO and NO-GO plugs readily reversed. Ample length to cut off end of plug when worn. Super-finished in controlled temperature and atmosphere for the ultimate in accuracy.

REVERSIBLE GO AND NO-GO THREAD GAGES

Offer the same economies and high degree of accuracy assured by plain plug gages. Readily reversible — insure six times the service life of ordinary thread gages.

SIZE CONTROL COMPANY

DIVISION OF AMERICAN MACHINE & GAGE CO.

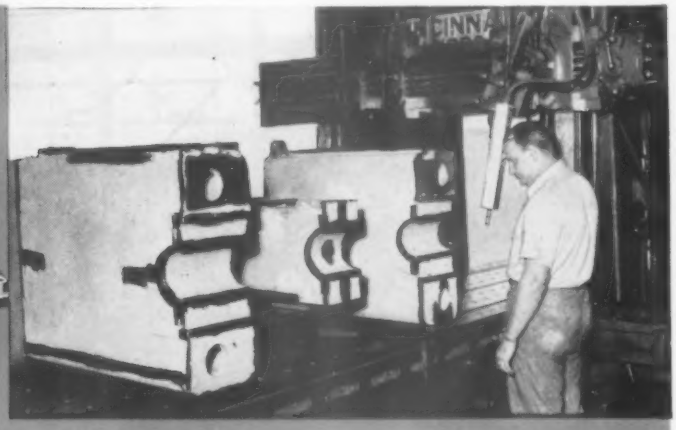
MAKERS OF PLAIN AND THREADED PLUG GAGES—GAGE SETS—DRILL SETS—FRACTIONAL SETS—THREAD WIRES—GEAR WIRES

Plant: 4652 Fulton St. Chicago (44). Offices in Buffalo, Elmira, Rochester, Syracuse and New York City, Milwaukee, Detroit, Minneapolis, Cleveland, Indianapolis, and Greenwich, Conn.

MODERN PRECISION WELDMENTS FOR "HEAVY STUFF"!

Modern large-scale precision weldments, made possible by advanced techniques developed during the war, are already proving highly advantageous in the heavy machinery industries. Special weldments, designed, fabricated and finished at Warren City, are replacing steel castings in many important applications. In the Bliss Enclosed Press shown here, the crowns, beds and slides are now Warren City weldments, saving weight and increasing strength. High precision is assured by accurate normalizing, stress relieving, machining and testing, with the finest and most modern scientific methods and equipment.

Finishing a precision-tested Bliss press crown, fabricated from welded steel plates at Warren City



WELDMENTS SAVE WEIGHT, ADD STRENGTH, IN FAMOUS BLISS INDUSTRIAL PRESSES

Eliminate Pattern Costs and Casting Defects!

IF YOUR PROBLEM involves the use of heavy steel castings or weldments, be sure you don't overlook the unusual production facilities and know-how available to you at Warren City Manufacturing Company. Located in the heart of the Cleveland-Pittsburgh industrial area, our huge seven-million-dollar plant contains every modern device for handling, cutting, fabricating, welding, normalizing, machining, assembling and testing heavy steel machinery, parts and equipment. Whether, as in the case of the E. W. Bliss Company, your situation may call for redesigning your present steel castings to enjoy the many advantages of modern precision weldments, or whether your need is simply for extra production capacity without increasing the size of your plant, our engineering staff will be glad to offer you their recommendations without obligation. Write today for our illustrated brochure, including a complete listing of our modern and extensive facilities.

WARREN CITY MANUFACTURING COMPANY ★★★

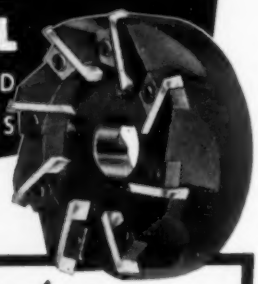
DEPARTMENT H

WARREN, OHIO

Wholly Owned Subsidiary of
GRAHAM-PAIGE MOTORS CORPORATION

The New KENNAMILL "UNIVERSAL" FACE MILL

WITH WEDGED-IN, SOLID KENNAMETAL BLADES

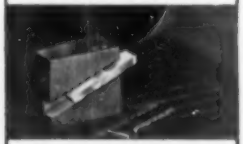


Reduces

- PRODUCTION COSTS
- TOOLING COSTS
- OFF-THE-JOB TIME
- GRINDING EXPENSE

ADAPTABLE FOR HIGH RATE MILLING ON ALL TYPES OF METAL

"Universal" Cutters for milling different materials vary only in the grade of Kennametal used in the blades, and the cutting angles. Kennametal blades are wedged into the body at fixed angles of 14° positive radial and 7° negative axial. Before being inserted, they are ground to provide a radial rake suitable for the material to be milled—7° negative for steel; 5° positive for cast-iron, brass, and bronze; 14° positive for aluminum and magnesium alloys. Only the blades are ground—the steel body is a permanent tool holder.



BLADES ARE RESHARPENED ON SURFACE GRINDER

Kennametal blades are reground uniformly to proper angles on a surface grinder, while being held in a simple jig. Illustration shows Kennametal blade in jig having top land ground, which, in conjunction with fixed blade angle in body, provides proper radial rake. Jig rests on another face for grinding clearance angle, and on a third face to grind face cutting edge angle. For finish cuts the face of the cutter is touched up on a cutter grinder. Reconditioning consumes much less time than is required for conventional cutters. Additional time is saved by having resharpened spares ready for quick replacement.

The Kennamill "Universal" Face Mill can be used for milling different materials, at high rates of metal removal, simply by inter-changing blades having the right grade of Kennametal and proper cutting angles. Advanceable, solid Kennametal blades are wedged in to the sturdy steel body at fixed angles, after having been ground on the edge to provide an effective cutting angle—negative radial rake for steel; positive radial rake for cast-iron and non-ferrous materials.

All design features of this cutter contribute to the possibility of removing a large volume of metal between regrinds. Radially set blades, rigidly supported, maintain their edge longer; and, because the blades are wedged-in instead of brazed-on, brazing strains are eliminated, either initially or during grinding. Hogging cuts, up to a depth of ½", are entirely feasible. Ample chip accommodation is provided for all depths of cuts.

The solid Kennametal blades can be reground on a surface grinder, as described at the left, thus eliminating need for special cutter-grinders, and greatly reducing off-the-job time required for reconditioning cutters having brazed-in tips. Blades can be resharpened many times, then used in smaller "Universal" Cutters.

The Kennamill "Universal" Face Mill is available in four sizes—4", 6", 8", and 10". Prices and particulars are yours for the asking.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

Are Your Machine Tools "Missing in Action"?

Many of these war veterans of production will be "found" and rehabilitated for the civilian jobs waiting for them by using

GLENCO Floating TOOL HOLDERS

Utility Tools

They compensate for misalignment due to wear instantly—automatically. You can produce TRUE, ACCURATE HOLES — without bell-mouth — with Glenco Floating Holders.

Actual compensating movements under load positively correct misalignment on hand and automatic Screw Machines, Garvin and all other types of Tapping Machines, Adjustable Multiple Spindle and all types of Drilling Machines.

Give your "War Veterans" of the production lines Glenco Tool Holder "treatment" and they'll be ready for the fighting veterans returning — they'll ALL be needed for full peace-time production.

Write for Data and TRIAL OFFER

THE J. C. GLENZER CO., Inc.

6467 EPWORTH BLVD. DETROIT 10, MICH.

FOR BETTER GAGING . . . "GO" GREENFIELD

ARE YOU USING *Chromium Plated* THREAD GAGES for EXTRA WEAR?

The longer life of chromium plated gages more than makes up for their high first cost and results in worthwhile net savings.

While "Greenfield" has supplied chromium plated gages for many years, wartime expansion of facilities and research has enabled us to greatly improve our methods and quality. Now we can furnish a vastly superior product including Thread Gages as well as plain gages.

For further information on "Greenfield" chromium plated gages, call your "Greenfield Man" through your local "Greenfield" distributor.

GREENFIELD

GREENFIELD TAP and DIE CORPORATION

GREENFIELD, MASSACHUSETTS

TOOL UP with TECO and get

- More pieces between grinds.
- More grinds per tool
- Less down time
- Lower tool cost

If you think your present carbide performance is "satisfactory" . . . you've got a profitable surprise coming when you use TECO Cemented Carbide. For TECO stays on the job much longer—produces more pieces between grinds—than any carbide you've ever used, as hundreds of plant experiences prove daily.

Maximum resistance to wear and to breakage is the answer . . . obtained by combining the correct qualities of hardness, toughness and uniformity in every piece of TECO Cemented Carbide.

The proof is in your own plant. Tool up a machine or two with TECO for an on-the-job comparison. Then check the number of pieces and cost per piece. Our tool engineers are glad to discuss your needs. Send for catalog and price list.

TUNGSTEN ELECTRIC CORPORATION, 570 39th St., Union City, N. J.

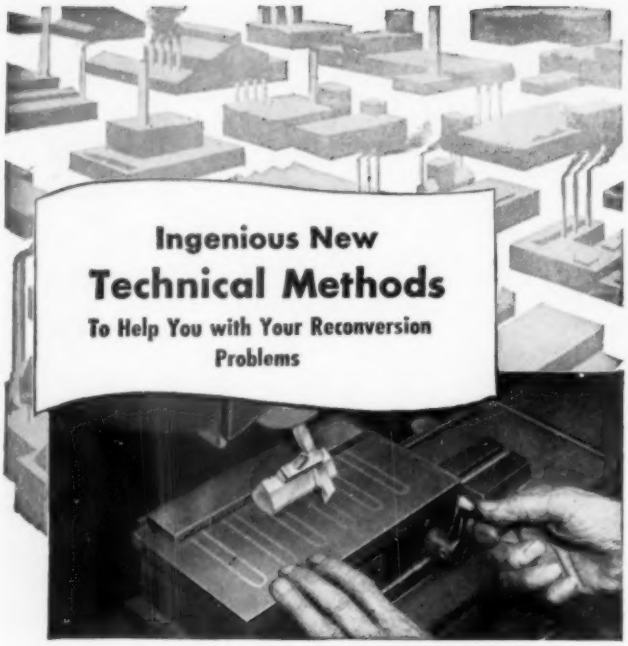
TECO

CEMENTED CARBIDE

Pioneers in Tungsten Carbides for over a Quarter Century

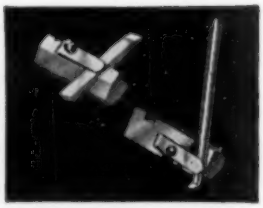
ARMY E NAVY

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representatives: Indianapolis, Ind. Chicago, Ill. Detroit, Mich.



NOW *ANYONE* CAN GRIND THREADING TOOLS!—WITH MASTER GRINDING GAUGE!

Until the advent of the Acro Master Grinding Gauge, only a skilled mechanic could grind thread-cutting tools to the required degree of accuracy. Now anyone can do it—in less time, with less waste, with even greater precision!



Acro Master Grinding Gauge

The cutting tool is simply placed in slot of the Master Grinding Gauge, and thumb screws hold it tightly in place, at the proper angle, while being ground on any type of surface grinder! The Gauge is made of hardened tool steel. There are no delicate or moving parts to get out of order. Milled slots at top and bottom provide correct grinding angles. A small set screw at end, eliminates any lateral motion. There is nothing special to learn—anyone can use it!

Anyone can be "helped on the job" by Wrigley's Spearmint Gum, too, once this quality product again becomes available. Just now, no Wrigley's Spearmint Gum is being made, and until conditions permit its manufacture in quality and quantity for everyone, we again urge you, please, to "Remember the Wrigley's Spearmint wrapper." It is our pledge to you, of the finest quality and flavor in chewing gum—that *will* be back!

Remember this wrapper

You can get complete information from:
Acro Tool and Die Works,
4554 Broadway, Chicago 40, Ill.

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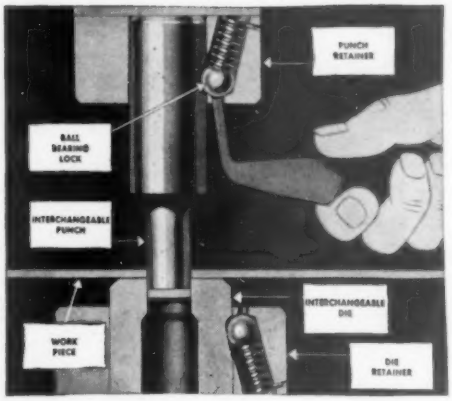


The Original Interchangeable Punch and Die

● Allied's R-B Interchangeable Punch and Die lowers costs in the metal working and plastic industries. Standard punches and dies carried in stock. Special shapes and sizes in any material made to your specifications with prompt deliveries. Send for large illustrated R-B catalog, now.

ALLIED PRODUCTS CORPORATION

Department 29E • 4630 Lawton Ave. • Detroit 8, Michigan

FOR CONTINUOUS HIGH DUTY PRODUCTION

Kaufman No. 10A Hi-Duty single spindle. Lead Screw Tapper made in 3 HP and 1½ HP models, with ¾" N.C. and 1½" N.C. Threads in alloy steel offers these features: Fully enclosed . . . lead screw and nut operate constantly in oil bath . . . positively wearproof clutches instantly engaged and controlled by air cylinder . . . quick traverse when not actually cutting threads . . . accurate depth control . . . control to protect tap overload, and further protected against jamming if work is placed in upside down . . . class 3 fits always assured and perfectly controllable. Complete information upon request.

KAUFMAN MFG. CO.

MANITOWOC, WISCONSIN

FUNDAMENTAL TO LOWER COST, VOLUME PRODUCTION ARE MODERN TOOLS SUCH AS MICROMATIC HONING MACHINES

Industry after the war will need modern production tools as much as it will need modern distribution methods. Micromatic Honing Machines have developed rapidly to ultra-modern, high speed tools for final precision machining.

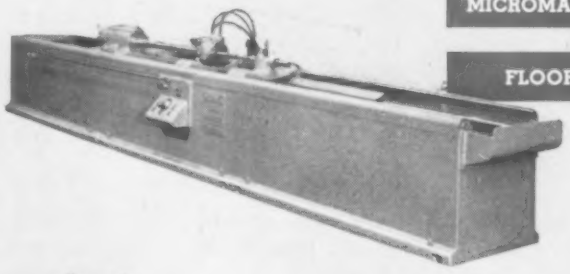
MICROMATIC MODEL 705 MULTIPLE SPINDLE VERTICAL HYDROHONER

with built-in automatic Microsize Control. For internal honing. Rotary indexing work table provides high production. Usually recommended for maximum stock removal ranging from .0005" to .0015" on hardened parts—.001" to .010" on soft or medium hard. Bores from ¼" to 2" diameter. Microsize control gauges work automatically. Work is held uniformly within tolerances of .0003". Honing cycle is automatically stopped when correct size is reached.

MICROMATIC MODEL 702 VERTICAL HYDROHONER

Standard single spindle type—built for rapid production honing of bores or cylindrical surfaces up to 2" in diameter.

MICROMATIC HORIZONTAL FLOOR TYPE HYDROHONER



for internal or external honing. Tool operates either under hydraulic or manual control. Tools available to generate either crosshatch or co-directional finish patterns. Full floating tool action. Stock removal .0015" to .002"—precision generated size limits .0003". Corrects error for taper to within .0001" limit. Size of work accommodated 1" up.

MICRO MATIC

MICROMATIC HONE CORPORATION

DETROIT 4, MICHIGAN

DISTRICT OFFICES: 614 Empire Building, 208 South Main St., Rockford, Illinois • 129 Church St., New Haven 10, Connecticut
501 Harries Building, 137 North Main St., Dayton, Ohio • 1031 South Broadway, Los Angeles 15, California

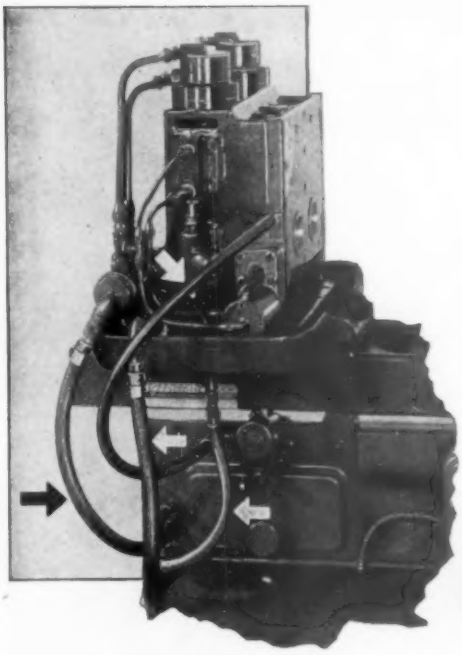
WHEN you think "postwar" you inevitably think of *higher production at lower cost.*

Good cutting fluids, properly applied, are always an important factor in achieving the greatest efficiency in metal working. When you can reduce machine down-time, improve work finish and save tools, your competitive odds are better.

D. A. Stuart Oil Company have been making and applying cutting fluids since 1865—gathering experience that is long, broad and successful—experience that you may use to advantage. Invite a Stuart Oil Engineer into your plant and through him the Stuart Organization will work with you in setting up cutting fluid standards for the top metal-working efficiency you will need for the times to come. No obligation, of course.

The 60-page Stuart booklet, "Cutting Fluids for Better Machining", contains interesting facts about cutting fluids and their application. *Write D. A. Stuart Oil Company, Limited, 2727-49 So. Troy Street, Chicago 23, Illinois.*

FAUVER INDUSTRIAL "ARTERIES"!



Conveying fluid power that puts the "GO" into machines and machine tools—day in and day out.

Two ply braided steel wire with Neoprene cover and lining combine the strength of steel and flexibility of synthetic rubber with high resistance to oils, acids, alkalines. The couplings are attached under 50 tons pressure.

The product of over 20 years experience, Fauver Hose Assemblies are integral parts of thousands of America's most efficient machines and machine tools.

Are they on yours?

J. N. FAUVER CO.

53 W. Hancock Ave. Detroit 1, Michigan

Use RED RING Lapping for Gear Teeth

When gear tooth surfaces have to be lapped, either to meet specifications or to correct heat treat distortion, the Red Ring Rotary Crossed Axes Method is preferred because of its unusual speed, accuracy and economy.

The Red Ring lap tooth surfaces slide over the work gear teeth in two directions simultaneously—a true lapping action. Furthermore, the pressure exerted on the work gear teeth is the same below the pitch line as it is above. This produces uniformly lapped tooth surfaces.

Spur, helical, shoulder and cluster gears with high, low, or ELLIPTOID tooth forms may be lapped on this machine. The machine is fully automatic and adjustable. If desired, the automatic cycle may be set to remove more stock from the drive face of the teeth than from the opposite face. Skilled operators are not required.

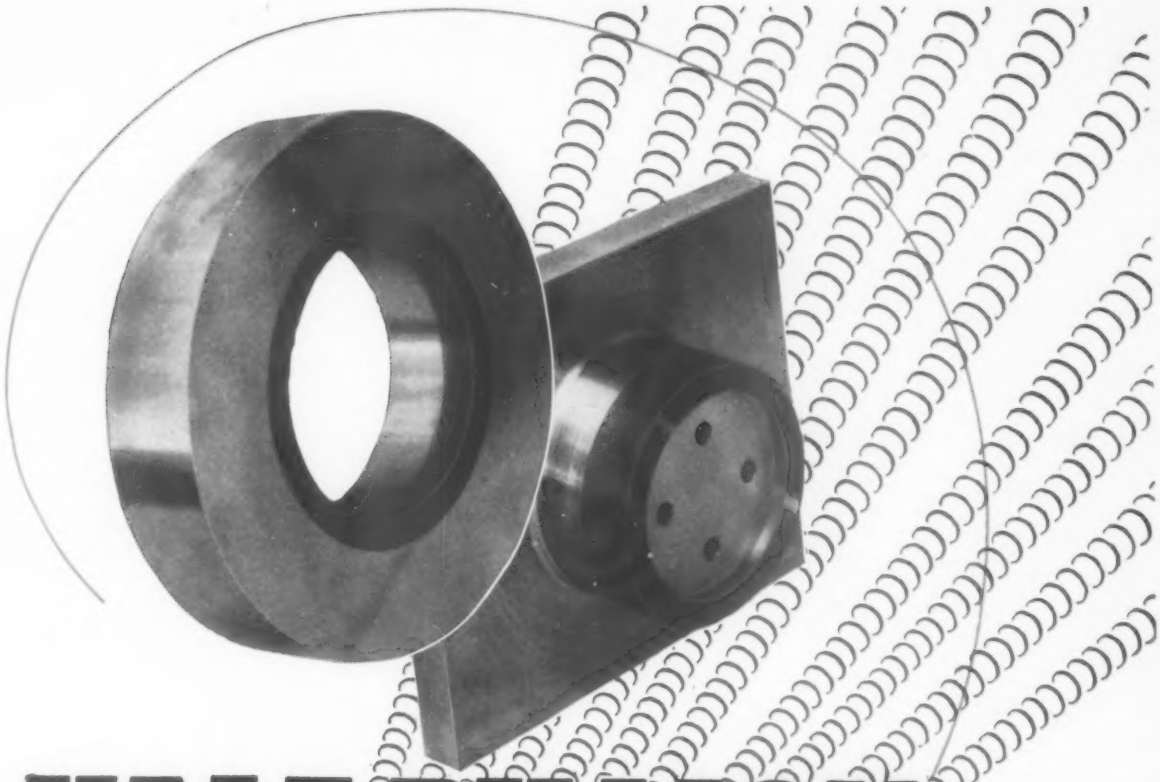
WRITE
FOR DESCRIPTIVE BULLETIN

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN DETROIT 13, MICH.

Specialists on Spur and Helical Involute Gear Practice
Originators of Rotary Shaving and Elliptoid Tooth Forms



over a HALF BILLION "cookies" .... and STILL GOING with these Diecarb dies

The original die, at the latest count, had produced the unprecedented total of over a half billion stampings, and was still going!

SEVERAL years ago, in a Pittsburgh electrical manufacturing plant, a disc or "cookie" die was placed in operation. It was made of Diecarb, Firth-Sterling's newest, original, sintered carbide development for blanking dies. This "cookie" die blanked a circle of silicon electrical sheet .025 inch thick, to be used in rotors and stators.

It proved so successful that since then two other similar Diecarb dies have been put to work—all averaging *50 to 60 million* blanks per grind, as compared with 90,000 pieces per grind with high speed steel dies.

In fact, the life of these remarkable Diecarb dies is not yet determined because all dies so far made are still in use.

Diecarb can be used for blanking and forming a diversity of materials including metals, plastics, paper, etc. It operates successfully on thicknesses up to 7/16 inch. It is proving unmatchable for high production operations, saving both downtime and maintenance.

If you have a product that requires blanking or if you are planning one—call in Firth-Sterling now to test the possibilities of Diecarb.

GET IN TOUCH WITH US

A complete Diecarb engineering service is at your call—for designing complete dies; for aiding in application of Diecarb to die shoes by brazing; shrink-fitting; press fitting and mechanical matrix; and for proper grinding.

Firth-Sterling

STEEL COMPANY

OFFICES: McKEESPORT, PA. • NEW YORK • HARTFORD • PHILADELPHIA
PITTSBURGH • CLEVELAND • DAYTON • DETROIT • CHICAGO • LOS ANGELES

You Get 65% Blade Usability

WITH THIS OK "DUAL" ADJUSTMENT

ROUGHING CUTTER

TAPERED, serrated blades fit into mating slots in the cutter body. There they are immovably held without wedges, pins or set screws—yet may be quickly removed. As the slots are at an angle to the body, when the blades are set out one or more serrations, as required for regrinding, both radial and axial adjustments occur at the same time *automatically!* This not only saves time in moving the blades into line of wear, but actually results in 65% blade usability.

In this design, blades and cutter bodies are available for either roughing or finishing. In the roughing cutter (left), the blades are inserted radially into the body and shear into the work in the direction of feed. Major wear and adjustment are on the *periphery*, the face of the blade merely scraping the work just cut.

In the finish milling cutter (right), the blades are ground with a slight lead, to produce a *skiving* cut. Here the major blade wear and the major adjustment are on the *face*.

We shall be glad to send you full details of this Dual Adjustable principle if you will write us.

FINISHING CUTTER

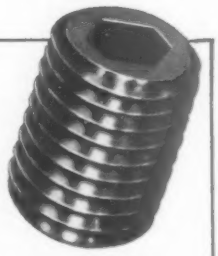
INSERTED-BLADE METAL CUTTING

TRADE O K MARK TOOL SYSTEM

MANUFACTURED ONLY BY THE O K TOOL COMPANY, SHELTON, CONN., U. S. A.

When you're in a TIGHT spot...specify *Mac-its*

PRONOUNCED MAC-IT



Mac-it alloy steel hollow set screws are milled from the solid bar, with die-cut threads. Hex sockets are generated by a special process insuring full-depth accuracy. Heat-treated for maximum strength and to prevent rounding out or splitting of the socket or upsetting of the point.

Mac-it products include Socket Head Cap Screws, Hollow Set Screws, Hexagon Head Cap Screws, Square Head Set Screws, Stripper Bolts, Hexagon Socket Pipe Plugs.
All are made of alloy steel and heat-treated.

STRONG, CARLISLE & HAMMOND CO. • Cleveland 13, O.

Smooth Sharp Edges

FOR CEMENTED CARBIDE TOOLS

Bay State provides top grinding performance for your cemented carbide tools because

1. Fractional Grades—
   3 grades within a grade, more accurately "fitting grade to grind."
2. Controlled Porosity—
   scientific control of wheel structure.
3. Consistent Duplication.

For grinding cemented carbide tools, you want sharpening wheels that are cool and fast-cutting, produce keen edges and have long life. Bay State's Green Grit Wheels meet these requirements fully.

KOOLPORE, Bay State's very open and porous Green Grit Wheel, is highly recommended by users for rapid grinding of the cemented carbides.

Make a trial of Bay State Green Grit regular structure and Koolpore types. For any grinding wheel need, remember Bay State's exclusive methods of duplicating original specifications. Write for recommendations for your needs or contact the Bay State distributor, warehouse, or field engineer in your area.

BAY STATE ABRASIVE PRODUCTS CO.
9 Union Street, Westboro, Mass.

BAY STATE

ABRASIVE PRODUCTS

Top Performance Consistently Duplicated

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS · MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS

Specify

Van Keuren WIRE TYPE PLUG GAGES

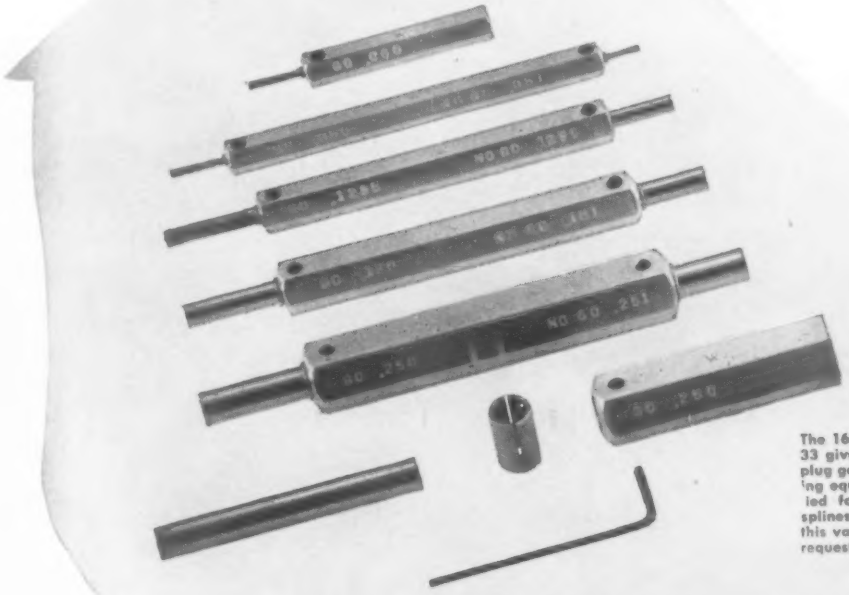
. . . for gaging small holes

Wire type plug gages were originated by the Van Keuren Co. in 1925. They are now in almost universal use for gaging small holes.

Longer lasting precision and lower gage cost is assured because the entire 2" length of the gaging unit can be used. When the end becomes worn, it is ground off and a new section of the original accuracy is moved out for use. The wire unit is securely held in the handle by a split bushing and a headless set screw.

Van Keuren wire type gages are made to Class B accuracy, $^{+.00005''}_{-.00000''}$ on the Go units and $\pm .000025''$ on the No Go units. Closer or wider tolerances can be supplied if desired.

Hard chromium-plated gaging units for use where the requirements are severe can be furnished at a slight additional cost.



The 160-page Van Keuren Catalog No. 33 gives full information on wire type plug gages and other precision measuring equipment. It also includes simplified formulas for measuring threads, splines, gears and worms. Your copy of this valuable handbook will be sent on request.

Wire Type Plug Gage Set No. 60. This set of gages provides accurate standards for checking twist drills in sizes from 1 to 60 (.228" to .040" diameter). A useful set of standard size gages. Price—$375.00.

Van Keuren Wire Type Plug Gage Set No. 80 which includes drill sizes from No. 1 to 80 (.228" to .0135"), price $425.00.

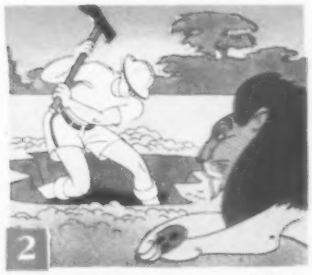
THE *Van Keuren* CO., 176 WALTHAM ST., WATERTOWN, MASS.

25th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

What will they cook up next?

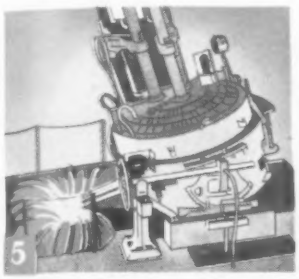
You make alloys by "cooking" several metals together.



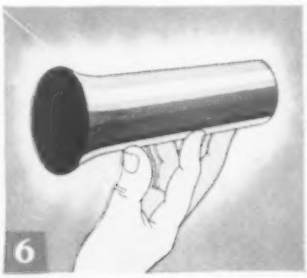
For example, you go to Africa and dig up some rare ore.

Then, you zip over to Turkey and dig up another kind . . .

. . . **and push off** for India for a third type. Next . . .



. . . **you mix 'em** exactly right and cook 'em in an electric furnace.

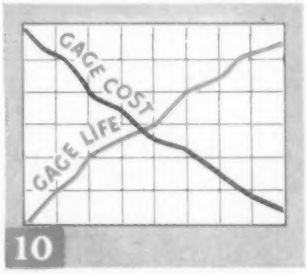


What have you got? STELLITE! A wonderful, useful new alloy.

N. A. Woodworth and Stellite engineers put their heads together.

Result! Long-wearing and corrosion-resistant GAGES.

Woodworth Gages of Stellite Cast Alloy *outwear steel 25 to 1.*



They increase gage life many times—reduce gaging costs.

And, *they won't rust or corrode,* in storage or in use.

Woodworth Gages made with Stellite set production records!

What Woodworth research means to industry

PIONEERING in the use of splendid new materials like Stellite is almost an everyday occurrence at Woodworth.

Here's why.

Every Woodworth product must conform to this basic research and manufacturing policy . . . *to make only products which will benefit industry through increased production and reduced costs.*

Since Stellite makes certain Woodworth products more efficient, it is being used. But, if tools and gages made out of *fragments of the moon* were required to speed up production and lower costs, our engineers would strive to find a way to furnish them.

Our always-try-to-make-it-better attitude should be of real help to industries preparing for the coming scramble for post-war markets.

ACCURACY YOU W CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD
DETROIT 20, MICHIGAN

PRECISION GAGES

PRECISION MACHINED PARTS

PRECISION TOOLS

Straight Shank Morse Taper Shank

Faster 2-STEP DRILLING WITH SUBLAND OIL-HOLE DRILLS!

It is amazing how much faster you can do 2-step drilling with Subland Oil-Hole Drills. The reason is obvious! With a constant stream of oil forced direct to each of the cutting edges, the drill can be operated at a much higher rate of speed than ordinary drills. The result is a great reduction in man-hours—in other words, reduced drilling costs!

MADE TO SPECIFICATIONS!

All sizes from ½" to 3½" in diameter and up to 36" overall. Please specify taper or straight shank. We also specialize in the manufacture of all types of subland drills and reamers.

DETROIT REAMER & TOOL CO.

2830 E. 7 Mile Road, Detroit 12, Mich.

Write for QUOTATION

Manufacturers of Oil-Hole Drills, Subland Drills, Special Reamers, Circularity Relieved Reamers, End Mills and Special Tools.

You Get GREATER ACCURACY!

That's the big reason why you should use a Ziegler Floating Tool Holder in tapping and reaming. By compensating for spindle misalignment up to 1/32", it makes possible perfect work even in case of inaccurate set-up.

Reduce Spoilage Losses!

If you are handicapped by inexperienced help, the Ziegler Tool Holder may prove to be the solution of your difficulties, speeding up production and cutting down costly spoilage losses.

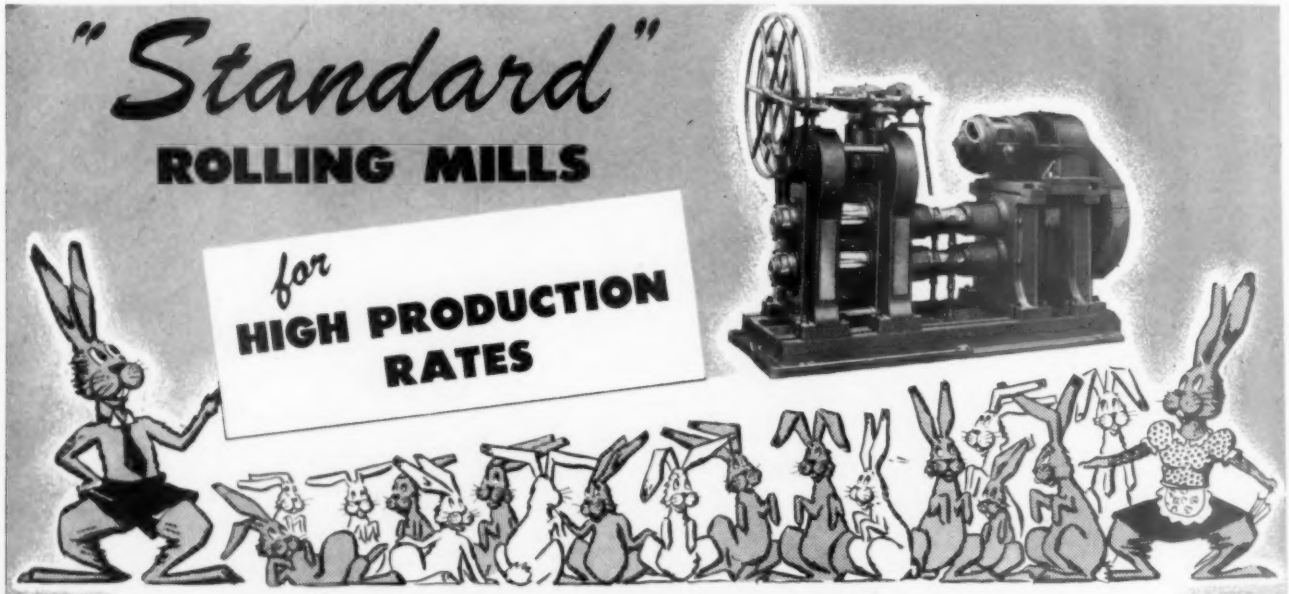
W. M. ZIEGLER TOOL CO.

1930 TWELFTH STREET DETROIT 16, MICH.

WRITE FOR CATALOG

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

"Standard" ROLLING MILLS for HIGH PRODUCTION RATES



"Standard" Rolling Mills assure high production hot or cold rolling of your strip, rod or ingot. Speeds are provided for rolling metals in any range from 10 feet to 500 feet per minute, depending upon your needs. Two, Three, or Four High Mills are available with roll sizes from 1½" diameter and 1" face to 16½" diameter and 18" face.

"Standard" manufactures special units for grading, cross and pinch rolling, forming wire to exact dimensions, and for a large variety of shaping operations.

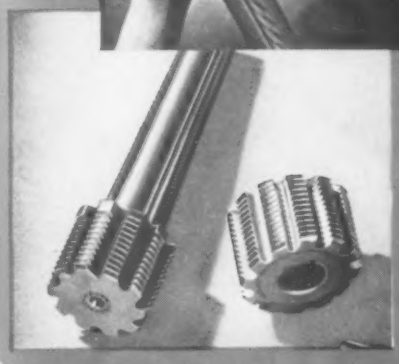
CATALOG SECTION RM AND DETAILED RECOMMENDATIONS WILL BE SENT UPON REQUEST.

STANDARD MACHINERY COMPANY

1585 ELMWOOD AVE., PROVIDENCE 7, R. I.

Do it with DALZEN

Left: Dalzen taps, in U. S., Metric, Whitworth, and Special forms are precision ground of hardened high speed steel in a complete size range. TUNGSTEN CARBIDE TAPS—EITHER SOLID OR INSERT—A SPECIALTY.



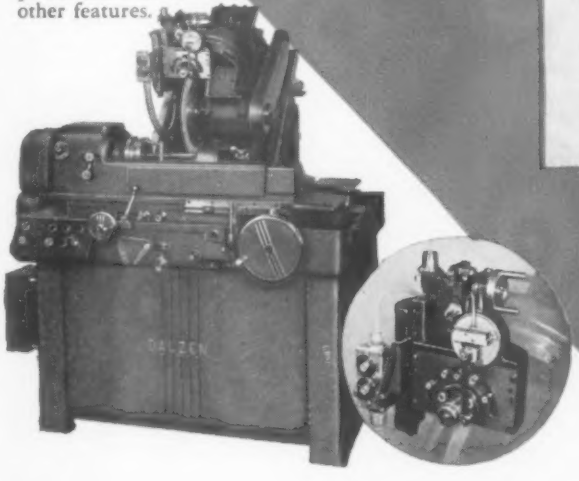
Left: High speed ground thread milling cutters, scientifically heat treated for longer cutting life.

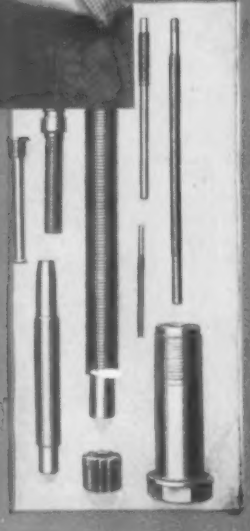
Dalzen manufactures an extensive line of precision cutting tools, parts, thread grinding and special machines—engineered for maximum efficiency and economical operation. Each is the result of years of experience on the part of designers and craftsmen. These are reasons why, all over the United States and in many foreign countries, master mechanics who have used and worked with Dalzen-made machines and tools say, "You can do it better with Dalzen." Write for details on how Dalzen can "do it better" for you.

Below: Dalzen "2-in-1" combines a dependable, accurate center lapping machine with a sturdy drill press. Saves on equipment costs, floor space.

Below: No. 5 *Electronic* Thread Grinder. Easy to operate. High production efficiency and accuracy by controlled wheel speed, motor driven dresser, automatic compensation and other features.

Right: No. 2 Thread Grinder. Compact, upright design saves floor space. Simple to operate. Low first and maintenance cost. Ideal for short or production runs.





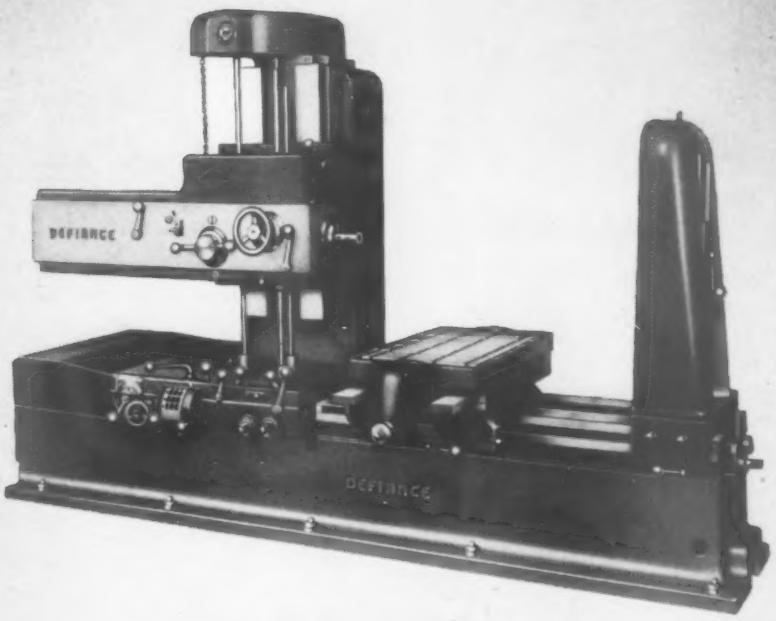
Right: Threaded parts are ground to close tolerances exactly to your specifications. Rigid inspection standards assure a uniform fine finish. Jobs requiring rolled or cut threads are also handled.

DALZEN

TOOL AND MANUFACTURING CO.

12255 EAST EIGHT MILE ROAD • DETROIT 5, MICH.

HORIZONTAL BORING MILL



● Defiance No. 22 horizontal Boring, Milling, Drilling and Tapping Machine has 2½" dia. spindle . . . rugged, simple and accurate for wide range of precision work in tool rooms. Speed and feed mechanism, and spindle housing are of unit construction.

Positive infinitely variable speeds from 25 to 1600 R.P.M. in either direction directly on the main spindle gives complete range of speeds on one spindle. 18 feeds in geometric progression, ranging from .002 to .125 per revolution of spindle. Five feeds are standard tapping leads. Column ways are 5" x 1½" and 18" across. Bed ways are 5" x 1½" and 24" across. Table ways are 4" x 1½" and 21" across. 24" x 36" table has working surface of its entire area with "T" slots and cross slots. Write. Defiance Machine Works, Inc., Defiance, Ohio.

ARMY E NAVY

DEFIANCE

BUILDERS OF PRECISION MACHINERY SINCE 1850

"ROCKWELL" HARDNESS TESTER *the Maker's Mark*

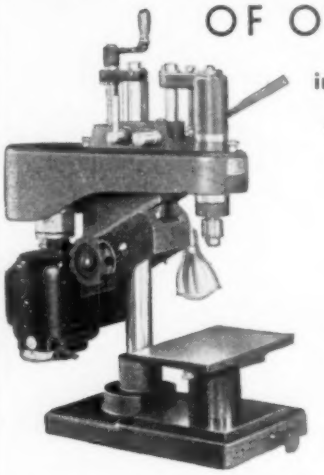
It is just 24 years since our first "ROCKWELL" Hardness Tester was launched.

Continuously, you have seen it improved. That steady improvement is what our Trade Mark . . . ROCKWELL . . . stands for. It is not the name of a machine. It is a maker's mark that guarantees always the most modern accuracy.

An Associate Company of American Chain and Cable

WILSON
MECHANICAL INSTRUMENT CO. INC.
383 Concord Avenue, New York 54

EXTREME CONVENIENCE OF OPERATION



in Drilling holes from .004" to .250" dia.

HAMILTON

Super-Sensitive

DRILLING MACHINE

Precision-built for precision drilling of those tiny holes which call for utmost exactness and perfection.

Write for bulletin

THE HAMILTON TOOL CO.
HAMILTON, OHIO

MIKROKATOR
"MIKRO" (MINUTE)
FRICTIONLESS AMPLIFICATION

Graduated: .0001" to .00001";
.001 mm to .0002 mm.

Complete elimination of friction, lag, and backlash insures positive, dependable, repeat readings. Pointer responds instantly to the slightest movement of measuring tip; no swinging past true reading, no waiting for pointer to come to rest. No lights or electromagnets, no warm-up period required. No electrical connections, can be readily moved to different locations.

Write for Circular-TE

SWEDISH GAGE CO. OF AMERICA
8900 ALPINE AVE. DETROIT 4, MICH.

Creators of Confidence in the Tool Salvage Process

HIGH SPEED STEEL AND TUNGSTEN CARBIDE.

CENTERLESS GRINDER REST BLADES.

Representatives Coast to Coast

National Tool Salvage Company

6511 Epworth Blvd., Detroit 10, Mich.

Just Think - - - AGED FOR OVER 1,000,000 YEARS!

PATENT PENDING

FOR millions of years these solid blocks of natural granite have been aging, growing harder every year, till today when they are quarried, surfaced and put to use by modern industry to aid in bringing a new standard of perfection in surface plates.

THE PROOF OF THE PUDDING

The proof of the pudding is in the eating—the proof of quality is in the roster of firms using these granite plates. Here are listed but a few of the nationally known firms using Herman Granite Surface Plates. • General Motors • Chrysler Motors • Ford • General Electric • Westinghouse Electric • Allis-Chalmers • International Harvester • Curtiss-Wright • Crosley Radio • Bendix • Bausch & Lomb, as well as U. S. Bureau of Standards.

Write us for authoritative governmental test.

THE NEW HERMAN GRANITE PRECISION SURFACE PLATES

A distinct improvement in surface plates, these granite surface plates are hard, smooth, stay free from grit. They are constructed to meet every requirement of the tool-room, production, and inspection operations, the greatest step forward in surface plate development in half a century.

HARDER THAN STEEL

Herman Granite Surface Plates are definitely superior to steel surface plates—will last 7 to 10 times as long —are practically indestructible. These plates are much harder than any tools to be used on them.

THE *New* HERMAN PRECISION GRANITE SURFACE PLATE

ACCURATE — EFFICIENT — ECONOMICAL

Accurate to within 1/10,000 of an inch—not affected by ordinary temperatures. Work can be done more quickly and efficiently due to hard, smooth surface. The original cost, comparable to that of steel, is saved many times over in savings in operational costs and additional tool costs.

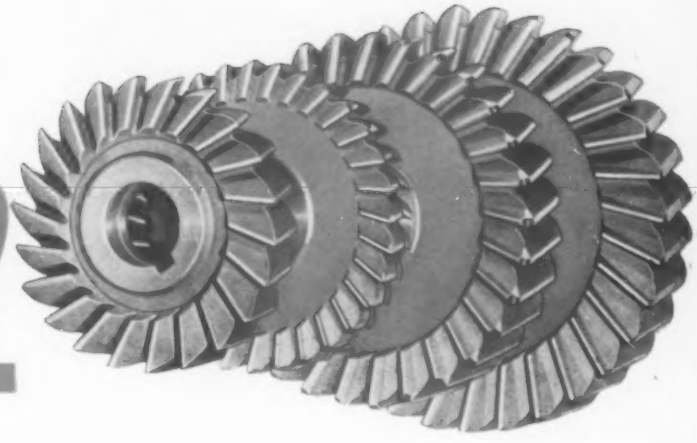
MAKE THE "STOP TEST" —

Make the shop test by writing us to request a specific date to try Herman Granite Surface Plates in your own shop under conditions as they actually exist, at our expense. Write today for descriptive literature and price list.

The Herman Stone Co.

324 Harries Bldg., Dayton 2, Ohio

MORE SPEED



for Tomorrow's Competition

Through 32 years of high speed tool recutting, converting and reclaiming . . . and long years of careful tool research, Eastern Cutter has achieved a standard of quality that is recognized by industry and manufacturers throughout the United States.

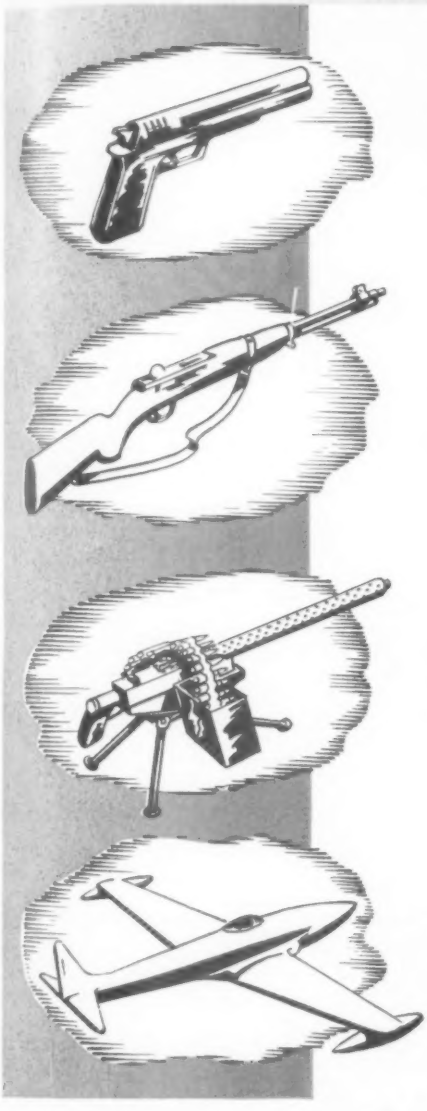
This standard of quality and uniformity is maintained by a staff of trained tool technicians and the most modern high speed tool recutting plant in the country. Every tool recut by us is subjected to the most rigorous specification of tool tests that assures you of new tool production at a saving of half the cost of new tools.

So in the peace days to come, have your worn tools recut by Eastern for more Speed to meet tomorrow's competition.

Send for our new catalog today

EASTERN CUTTER
CORPORATION
30-32 LITTLETON AVE. NEWARK 7, NEW JERSEY

Broaching's WAR-PROVED EFFICIENCY CAN HELP YOU NOW!



When the finishing of grooves in pistol frames was changed to broaching, one broaching machine and one operator replaced six machines and six operators . . . yet production was greatly increased. The result was faster production of a better gun at lower cost.

The engineers of one large plant producing Garand rifles figured savings at $397,623 in capital investment, $266,000 per year in wages at $1.00 per hour, 2000 square feet of floor space, plus the lessened maintenance cost of fourteen machines that did the work of 111 machines formerly used.

Machine gun barrels were changed from rifling with many passes by a single point tool to broaching in one pass. In one instance, out of nearly 19,000 barrels produced only 41 were scrapped, a reduction of 97% from average scrap loss.

The intricate "Christmas tree" that fastens the blades to the rotor in a jet engine must be accurate to the closest limits. To produce this odd and difficult shape to press fit tolerances, broaching and broaching alone was suitable.

THESE WAR-LEARNED LESSONS ALSO APPLY TO PEACE-TIME PRODUCTION

Faster Production . . . Greater Accuracy . . . Lower Costs . . . all of these things and more can be had in your peacetime production by applying the experience of Detroit Broach. Call in a Detroit Broach engineer and go over your production methods with him. He will give you complete production and cost figures on your own job. It costs nothing to get the facts. Call or write today.

MEMBER BROACHING TOOL INSTITUTE

DETROIT *Broach* COMPANY

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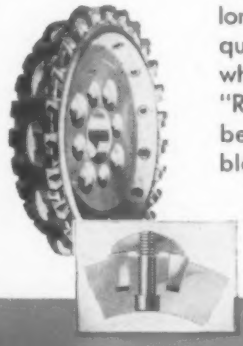
Index of Tool Engineer Advertisers

November, 1945

. . . is the Word for *Continental* Inserted Blade Face Milling Cutters

● Continental Type "R" Inserted Blade Face Milling Cutters and Shell End Mills have hardened cutter bodies and are practically indestructible. This prevents mutilation of blade slots and permits accurately ground and hardened surfaces for contact with machine arbors. Continental Cutter bodies have no screw threads or serrations to wear out, strip or become plugged. Wedge shaped blades are securely held in place by positive clamp lock . . . are easily removed without injury to blade or carbide tip. Continental Type "R" blades are longer, giving more grinds per blade. Blades can be quickly and individually adjusted. This reduces waste when carbide tipped blades are used. Continental Type "R" cutters are available in a wide range of sizes. Can be furnished with carbide tipped or high speed steel blades—in positive or negative rake. Continental Type "R" cutters "can take it." For lower tool cost on "tough" jobs specify Continental Type "R" Cutters.



CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN

CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

Continental
CUTTING TOOLS

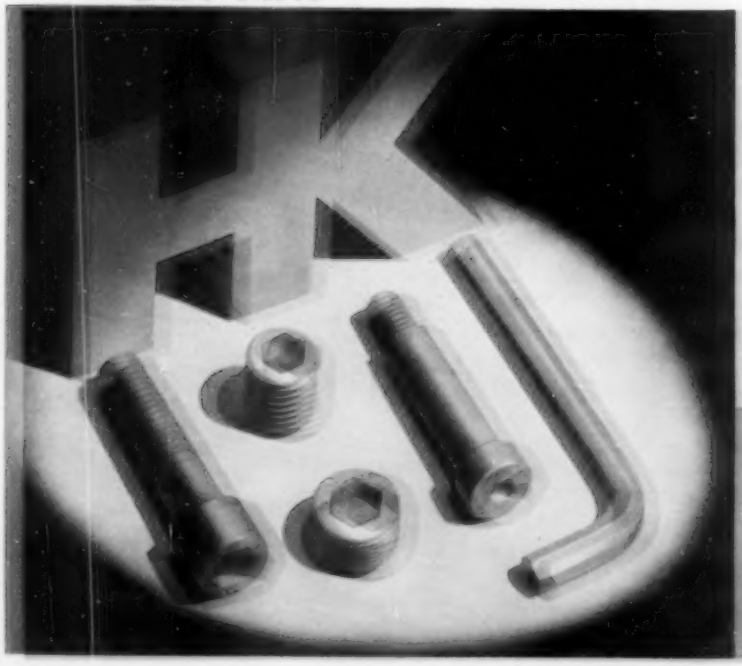
- Boring Bars and Tools
- Broaches
- Broach Pullers
- Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

HOLO-KROME *fibro forged* SOCKET SCREWS

..INTERNAL WRENCHING

QUICK AND POSITIVE

THE *BETTER* FASTENING METHOD



Industry is taking advantage of its war time experience in the use of Holo-Krome Socket Screw products, by incorporating them in the design and the redesign of its peace-time products .... New applications for Holo-Krome FIBRO FORGED Screws — the Completely Cold Forged Screws — are increasing daily .... Unfailing performance is the Holo-Krome guarantee .... Save weight, space and assembly time, specify "Holo-Krome." *The Holo-Krome Distributor is ready to serve you.*

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Main Offices & Plant

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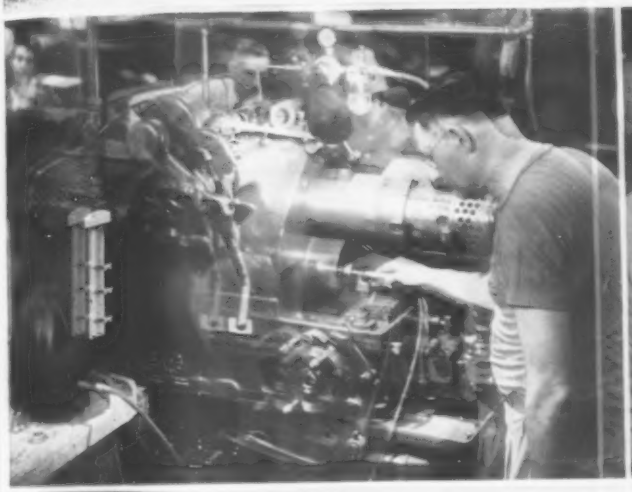
MODERN PROCESS CONTROL *Slashes Production Costs*

Today's use of precision indicating instruments at the machines to check parts as they are being produced is a thrifty practice and results in slashing production costs. Inspection of each piece as it is made, with no extra time required, enables the operator to adjust the machine or tools before scrap is produced. Each operator produces a far higher percentage of acceptable parts—good parts which might previously have been improperly rejected are accepted—rejections are reduced—and the scrap pile, as such, is eliminated.

Time is saved on the assembly line because every part fits as it should — no subassemblies have to be torn down and reassembled. Salvage and rework time are practically eliminated. The completed product will be of higher quality, require less service and give more years of trouble-free performance.

Spending money for Sheffield Precisionaires, Visual Gages, Multicheks, Dial Indicator Snaps, Thredcheks, etc. . . . results in saving money by slashing production costs.



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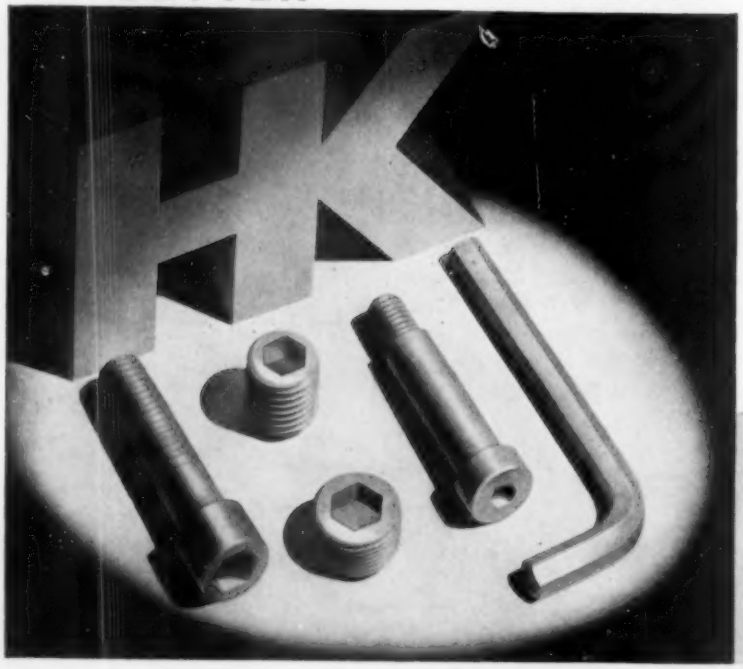

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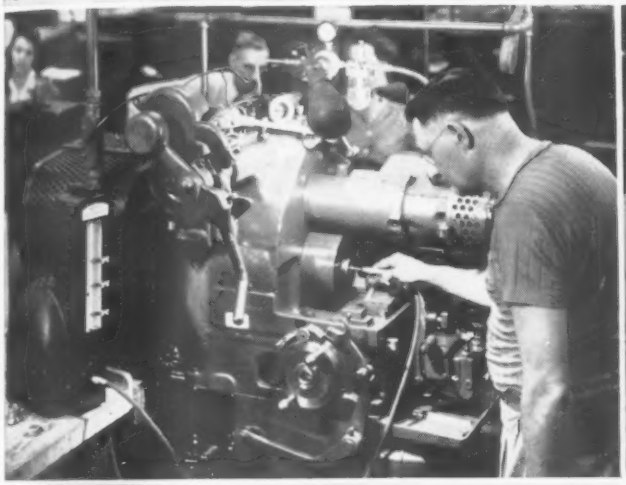

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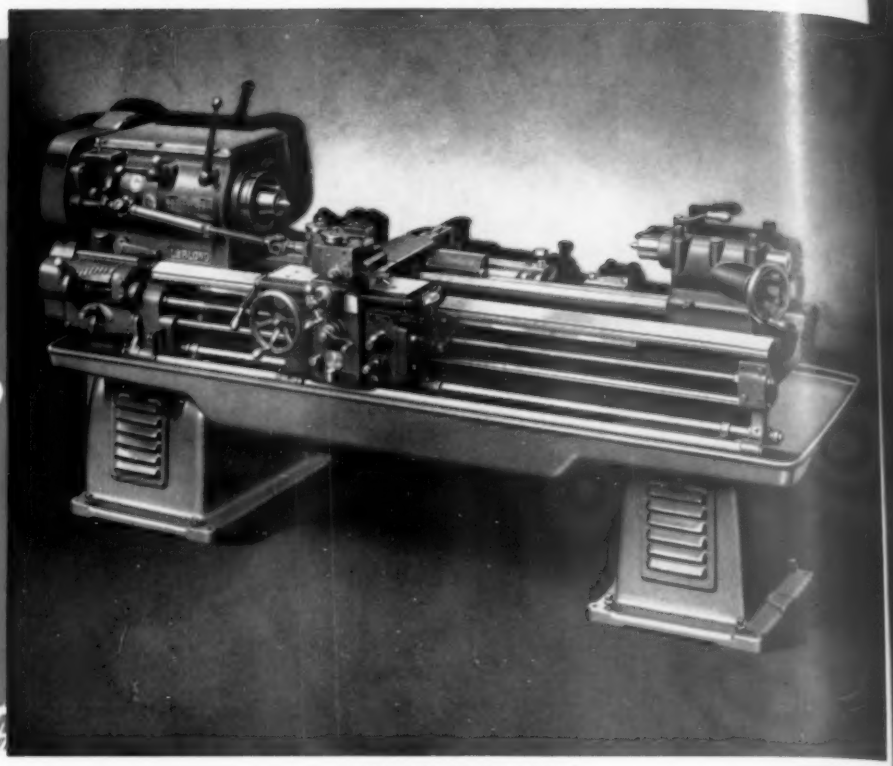

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